

THE GENUS *AMARANTHUS* IN SOUTHERN AFRICA

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ABSTRACT

A key to and descriptions of the 15 native and introduced species of *Amaranthus* in Southern Africa are given, preceded by a discussion including comments on origins. Some are common weeds. *A. praetermissus* (widely distributed) and *A. dinteri* subsp. *brevipetiolatus* (O.F.S. and Cape Province) are new taxa. *A. dinteri* var. *uncinatus* is transferred to *A. capensis* and a new combination made.

UITTREKSEL

DIE GENUS *AMARANTHUS* IN SUIDELIKE AFRIKA

'n Sleutel tot en 'n beskrywing van die 15 inheemse en ingevoerde soorte van Suidelike Afrika word gegee, voorafgegaan met 'n bespreking van plekke van oorsprong. Sommige is gewone onkruid. *A. praetermissus* (wydverspreid) en *A. dinteri* subsp. *brevipetiolatus* (O.V.S. en Kaapprovinsie) is nuwe taksa. *A. dinteri* var. *uncinatus* word na *A. capensis* oorgeplaas en 'n nuwe kombinasie word gemaak.

Various species of amaranth together provide one of the commonest and most widespread groups of weeds in southern Africa. Almost everywhere, from Cape Town to the tropics, where the ground has been disturbed and there is not too much competition from other vegetation, there will amaranths, often more than one species in company, be found. Only perhaps at high altitudes when the climate is too harsh, are they rare or absent.

Not only do amaranths have an importance to man, albeit usually an unpleasant and unwanted one in their capacity as unwelcome weeds, but some have a more positive economic value. Particularly in the tropics and subtropics, species are cultivated for their edible leafy shoots reminiscent of spinach. In some parts of the world, particularly South America and Asia, the seed is eaten and provides an economic plant product of some local importance. I am not aware that this happens in southern Africa.

In view of their frequency and significance, it seems surprising that apparently only one separate treatment (i.e. not in a check-list or a flora) of *Amaranthus* in southern Africa has so far appeared; that by Adamson in Jl S. Afr. Bot. 2: 191-195 (1936).

The reasons for this comparative neglect are, however, not hard to find. The taxonomy of the genus has been generally recognised as complex, and difficulties and uncertainties abound. Furthermore there is still considerable taxonomic disagreement among experts over important matters. Many species are wide-

Accepted for publication 25th September, 1980.

spread and common and have accumulated formidable and complex synonymies, again with uncertainties and disagreements. It is thus difficult or impossible to carry out a satisfactory regional revision without drawing on and assessing knowledge derived from other, widely distant parts of the world. So it is for southern Africa.

In 1961 I published a revision of *Amaranthus* in Britain [Watsonia 4, 6: 261–280 (1961)]. Included here were several species originating from South Africa, some not too well known. During a visit to South Africa at the end of 1975 and in early 1976, special attention was paid to all species of amaranth met with, and this proved most useful in clarifying the concept of various puzzling taxa. As a result it seemed worth-while to try to improve and bring up-to-date the taxonomy of the genus in southern Africa.

The continent of Africa is generally poor in amaranths. The only species almost restricted to tropical Africa is the remarkable *A. sparganiocephalus* Thell., occurring in N.E. tropical Africa and extending to adjacent Arabia. The widespread and variable *A. graecizans* L. may be truly indigenous there, as is *A. thunbergii* Moq. in east tropical Africa, where it occurs northwards to Somalia (in the west to Angola), though this most probably represents a northward extension of range of an originally southern African species.

Southern Africa is thus the most significant part of Africa for the genus. Fifteen species occur, and it is convenient to categorise them into those that are clearly indigenous and those that are not:

A. NATIVE SPECIES

<i>A. thunbergii</i>	South Africa N. to Somalia, Zambia, Angola.
<i>A. dinteri</i>	South, South-West Africa, Botswana.
<i>A. capensis</i>	South Africa and Lesotho.
<i>A. praetermissus</i>	South Africa, South-West Africa, Botswana, Zimbabwe, Angola.
<i>A. schinzianus</i>	South and South-West Africa.

B. PROBABLY OR CERTAINLY NON-NATIVE SPECIES

<i>A. hybridus</i>	Widespread in tropics and subtropics.
<i>A. retroflexus</i>	Native of North America and Mexico.
<i>A. dubius</i>	Native of tropical America.
<i>A. spinosus</i>	Pantropical.
<i>A. blitoides</i>	Native of North America.
<i>A. deflexus</i>	Widespread in tropics and subtropics.
<i>A. lividus</i>	Widespread in tropics and subtropics.
<i>A. viridis</i>	Widespread in tropics and subtropics.
<i>A. standleyanus</i>	Native of Argentina.

It is surprising that the widespread *A. graecizans* L. has apparently not yet been found in the northern part of southern Africa as it is so frequent and widespread in tropical Africa to the north of our area. The comment under several species in category B above that they are widespread should not be taken to imply that that represents their range as native plants. As often happens with widespread weedy species, it may be impossible to separate their original indigenous area from the much larger area they may have subsequently attained as weeds in the footsteps of man.

One cannot help speculating on the possible origin or origins of the indigenous southern African species. The greatest frequency appears to be from the Transvaal and the Orange Free State westwards through the northern part of Cape Province to South-West Africa. At low altitudes in Natal and eastern Cape Province only *A. thunbergii* occurs. All the species, however, occur in the Great Karoo region bounded by Graaff-Reinet, Nelspoort, Prince Albert and Willowmore. All except *A. capensis* reach South-West Africa, but only the widespread *A. thunbergii* occurs in the fynbos regions of the south-western Cape (there are doubtful records of *A. capensis*). The evidence seems to point to a local centre of endemism in the drier parts of south and southern South-West Africa.

As has been already mentioned, tropical Africa is generally poor in native *Amaranthus* species, and the same can be said of Europe and Asia. There is no clear evidence of close affinity between the southern African species and those to the north. It is, however, noteworthy that *Amaranthus* is especially well represented in tropical and South America and with a number of endemic species in Australia.

The native southern African species as a group seem perhaps to be comparable in origin with the South African species of such genera as *Tetragonia*, *Carpobrotus*, and *Cotula*, all of them Southern Hemisphere genera with markedly disjunct distributions in Africa, Australia and South America. It is difficult to achieve any certainty here. The problem has been recently discussed by Goldblatt in Ann. Miss. Bot. Gard. **65**, 2: 369–436 (1974), who (p. 403) suggest the probability of long-distance dispersal. Certainly many species of *Amaranthus*, which usually produce a profusion of seed, have been conspicuously successful in achieving wide ranges.

It would be wrong to give the impression that the taxonomy of *Amaranthus* in southern Africa does not still present a number of problems and uncertainties well worthy of further study. Amaranths are generally not attractive plants to the average collector, especially in South Africa where there are so many more colourful plants to catch the eye. Inadequacy of collected material of some taxa is still an obstacle.

For example, *A. capensis* subsp. *uncinatus* is far better known from adventive material from Europe than as a native in South Africa. Further collections

and study may well cause a revision of its taxonomic status. *A. dinteri* subsp. *brevipetiolatus* might well merit a similar comment.

Amaranthus thunbergii is widely spread both geographically and climatically, and is variable. There may well be ecotypic differentiation and experimental cultivation would certainly be rewarding.

Although a number of hybrids between different species have been recorded in Europe and elsewhere, there has been no clear evidence of hybridisation occurring between the species occurring in southern Africa. Nevertheless, the possibility must be borne in mind.

KEY TO SOUTHERN AFRICAN SPECIES

- 1a. Axils of stem-leaves mostly bearing paired spines; terminal part of inflorescence spike-like; fruits dehiscent or indehiscent 4. *A. spinosus*
- 1b. Axils of leaves without spines:
 - 2a. Inflorescence composed of axillary cymose clusters, the stems thus appearing leafy to apices (Figure 1 B); ♂ and ♀ flowers with 3 perianth-segments (except in 9. *A. praetermissus* and 10. *A. schinzianus*):
 - 3a. Female flowers with 4–5 perianth-segments: leaves oblanceolate to linear:
 - 4a. Perianth-segments of ♀ flowers in fruit spatulate to obovate, not or only very shortly mucronate at apex, 0,75–1,5 (–1,75) mm long, shorter than fruit 10. *A. schinzianus*
 - 4b. Perianth-segments in fruit lanceolate to oblong, ovate-oblong or oblanceolate; acumen at apex variable, often 0,25–1 mm long; the longest ♀ perianth-segments exceeding subequalling or only slightly shorter than fruit:
 - 5a. Leaves not exceeding 10 mm in width; ♀ flowers with subequal perianth-segments with a conspicuous acumen 0,25–1 mm long at apex; widespread native species 9. *A. praetermissus*
 - 5b. Leaves (at least larger stem leaves) usually 10 mm or more wide; ♀ flowers with markedly unequal perianth-segments with only a very short point up to 0,2 mm long at apex; a rare introduction from North America 8. *A. blitoides*
 - 3b. Female flowers always with 3 perianth-segments, variable in shape, but rarely obovate; perianth-segments themselves 1,5–5 mm long; leaves obovate to elliptic:
 - 4a. Perianth-segments equalling or exceeding fruit; fruit circumsessile:
 - 5a. Stems at least when young pubescent with elongate but crisped hairs (hairs sometimes sparse); ♀ perianth-segments narrowed to a fine, suberect or patent, never markedly hooked, subulate acumen 0,75–2 mm long; leaves usually broadest above middle and ± narrowed to the obtuse apex 5. *A. thunbergii*
 - 5b. Stems when young without elongate crisped hairs, but ± clothed with short straight or papilliform hairs; ♀ perianth-segments with a short acumen 0,1–0,5 (0,75) mm long (if longer then acumen conspicuously reflexed-hooked); leaves sometimes as in *A. thunbergii*, but often broadest near the rounded apex:
 - 6a. Female perianth-segments (in fruit) lanceolate, attenuate to a long narrow acumen markedly uncinately hooked above; ♀ perianth-segments 2,5–5 mm long; acumen mostly green with stout midrib. 7. *A. capensis* subsp. *uncinatus*
 - 6b. Female perianth-segments (in fruit) ovate to oblong or ± enlarged or even spatulate above, rounded to shortly nar-

rowed above to an acumen 0,1–0,75 mm long, suberect or spreading, rarely deflexed or $\pm$ hooked; ♀ perianth-segments 0,1–3,5 mm long (rarely to 5 mm):

- 7a. Perianth-segments (at least 1–2) of ♀ flowers strongly broadened above and markedly unequal; apical part of broader segments green with vein-network, obtuse to subacute with a short $\pm$ deflexed mucro about 0,1 mm long; anthers 1 mm long, distinctly exserted from ♂ flowers. 7. *A. capensis* subsp. *capensis*
- 7b. Perianth-segments of ♀ flowers subequal, not or only slightly widened above, mostly ovate to oblong, less markedly venose above, with an erect or $\pm$ spreading point, 0,1–0,75 mm long; anthers about 0,5–1 mm long, only slightly exserted 6. *A. dinteri*
- 4b. Perianth-segments shorter than fruit; fruit indehiscent, leaves nearly always strongly emarginate at apex. 12. *A. lividus*



FIG. 1

A, *Amaranthus hybridus* subsp. *hybridus*. B, *Amaranthus thunbergii*. To show inflorescence-types indicated respectively by alternatives 2b and 2a in the key. A from Scheepers 1279; B from Hanekom 1332.

- 2b. Inflorescence forming a terminal branched or spike-like panicle (Figure 1 A); ♂ and ♀ flowers usually with 5 perianth-segments (3 in *A. deflexus*, *A. lividus* and *A. viridis*):
- 3a. Fruits indehiscent or irregularly rupturing; perianth-segments 3-5:
- 4a. Fruits shorter than, subequalling or scarcely exceeding the ♀ perianth, always strongly and closely rugose or rugose-muricate; ♀ perianth-segments oblong to spatulate, obtuse to rounded, rarely subacute at apex:
- 5a. Leaves linear to linear-lanceolate, rarely lanceolate, not more than 10 mm wide; perennial; ♀ perianth-segments 5 14. *A. muricatus*
- 5b. Leaves ovate to elliptic, mostly more than 10 mm wide; plants usually annual; ♀ perianth-segment 3-5:
- 6a. ♀ flowers with 5 perianth-segments 2-3 mm long; seed very glossy, not or scarcely reticulate, 0.8-1.1 mm in diameter. 15. *A. standleyanus*
- 6b. ♀ flowers with 3 perianth-segments 1-1.5 mm long; seed only slightly shining, with surface minutely and very closely roughened-reticulate. 13. *A. viridis*
- 4b. Fruits distinctly exceeding the ♀ perianth, smooth or only slightly wrinkled on drying; ♀ perianth-segments varying from linear to spatulate and acute to rounded at apex:
- 5a. The fruits ellipsoid, scarcely compressed; seeds ellipsoid; plant perennial; leaves subacute to obtuse and only sometimes slightly emarginate at apex. 11. *A. deflexus*
- 5b. The fruits rotund to shortly pyriform, compressed; seeds ± rounded; plant annual, occasionally a short-lived perennial; leaves nearly always broadly and conspicuously emarginate at apex 12. *A. lividus*
- 3b. Fruits regularly circumscissile; perianth-segments always 5:
- 4a. Stems ± densely clothed with short crisped pubescence, especially above; leaves shortly hairy beneath, especially on midrib and principal nerves; perianth-segments of ♀ flowers with midrib apparently disappearing below the rounded or emarginate apex 2. *A. retroflexus*
- 4b. Stems glabrous to subglabrous or puberulous, sometimes with some short pubescence near inflorescence but then ♀ perianth-segments mostly acute to subacute:
- 5a. Perianth-segments of ♀ flowers mostly acute to subacute, sometimes (subsp. *cruentus*) oblong and subobtuse but not spatulate; bracteoles about as long as to (more usually) twice as long as ♀ flowers 1. *A. hybridus*
- 5b. Perianth-segments of ♀ flowers obtuse to rounded, oblong-spatulate; bracteoles about as long as or only very slightly longer than the ♀ flowers; inflorescence with elongate spiciform branches 20-250 mm long, ♂ towards apex, mixed in middle, ♀ below. 3. *A. dubius*

1. *Amaranthus hybridus* L., Sp. Pl. 990 (1753); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 234 (1914); Adamson in Jl S. Afr. Bot. 2, 4: 192 (1936); Adamson in Adamson & Salter, Fl. Cape Penins. 360 (1950); Henderson & Anderson, Common Weeds S. Afr. 108, figure 53 (1966); Suessenguth & Pod-

lech in Merxmüller, Prodr. Fl. Südwestafr. 33 Amaranthaceae: 8 (1966); Ross, Fl. Natal 158 (1972). Type: grown at Uppsala, Herb. Linnaeus 1117/19 (LINN, lectotype).

Annual. Main stem usually erect, sometimes ascending, 0.15–2.0 (–3.0) m high, subsimple or branched, glabrous to shortly and inconspicuously pubescent especially above. *Leaves* with petiole 10–80 (–150) mm long; axils without spines; lamina variable in shape, elliptic to ovate or lanceolate, 25–150 (–300) mm long, 15–80 (–120) mm wide, glabrous or subglabrous, or slightly and inconspicuously pubescent along midrib and main nerves beneath, attenuate to cuneate towards base, gradually narrowed towards the obtuse to subacute apex, green to red. *Inflorescence* terminal and from upper axils, green, red, purple or yellowish, usually of spiciform branches aggregated into a panicle, sometimes simply spiciform, up to about 500 mm long and 250 mm wide. ♂ and ♀ flowers mixed. *Bracteoles* about as long as to about twice as long as flowers. ♂ flowers with 5 ovate-acuminate to oblong-lanceolate perianth-segments 1.5–2.5 mm long. ♀ flowers with 5 ovate to oblong perianth-segments 1.5–3.5 mm long, ± aristate-acuminate at apex or the inner acute to subacute or even obtuse; segments usually unequal. *Stigmas* about 0.25–0.75 mm long. *Fruit* about as long as the longer perianth-segments, circumscissile with the upper part swollen and ± wrinkled to not swollen and smooth. *Seed* very glossy, blackish-brown, sometimes white and hardly glossy, rounded-elliptic, 1–1.5 × 0.8–1.25 mm, not or very faintly reticulate.

subsp. **hybridus**; Brenan in Watsonia 4, 6: 267 (1961).

A. paniculatus sensu Cooke & Wright in Thiselton-Dyer, Fl. Cap. 5, 1: 409 (1910); Burt Davy, Fl. Transv. 180 (1926) non L.

A. powellii S. Wats. in Proc. Amer. Acad. 10: 347 (1875); Sauer in Ann. Miss. Bot. Gard. 54, 2: 108 (1967). Type from the U.S.A.

Larger bracteoles of ♀ flowers about 1.5–2 times as long as the perianth. Upper part of fruit (including style-bases) ± inflated and wrinkled, forming a sort of “beak”.

S.W.A.—1820 (Tarikora): Omuramba Omatako, 6 km. NE of Kapupahedi on road to Ndonga (-AB), *de Winter & Marais* 4753 (K), 2017 (Waterberg); Waterberg (-?), *Volk* 1120 (K, PRE).

—2116 (Okahandja); Okahandja (-DD), *Dinter* 311 sub SAM 70761 (SAM).

—2214 (Swakopmund): Haigamkab (Haigamchab) (-DB), *Galpin & Pearson* 7453 sub SAM 1681 (PRE, SAM); Omaruru R. mouth (-AB), *Ihlenfeld, de Winter & Hardy* 3173 (PRE).

—2217 (Windhoek): Windhoek, Aris (-CC), *Seydel* 2587, 3475 (L), 4086 (K).

TRANSVAAL—2330 (Tzaneen): Letaba (-CD), *Scheepers* 643 (K) (untypical with bracteoles shorter than usual).

- 2527 (Rustenburg): Rustenburg (-CA), *Nation* 119 (K).
- 2528 (Pretoria): near Pretoria (-CA), *Wilms* 1251a (BM); Pretoria, the most abundant weed of cultivated ground, *Burt Davy* 885 (BOL); Pretoria, Prinshof Pasture Research Station, *Liebenberg* 3255 (K, PRE); Pretoria, Corellilaan, Les Marais, *Hanekom* 1326 (K, PRE); Pretoria, Division of Botany, *Lansdell* 628 (K); Irene (-CC), *Pole Evans* 4801 (PRE).
- 2530 (Lydenburg): Lydenburg (-AB), *Wilms* 1251 (E, K, PRE); Belfast, Farm Rietvlei (-CA), *Burt Davy* 258, sub Transvaal Dept. Agric. Herb. 3219 (BM).
- 2531 (Komatipoort): Barberton (-CC), *Cotton Exp. Station* 17 (K).
- 2627 (Potchefstroom): Potchefstroom (-CA), *Burt Davy* 1050 (K).
- 2628 (Johannesburg): Johannesburg (-AA), *Moss* 4347 (BM, J).
- 2629 (Bethal): Standerton (-CD), *Burt Davy* 1805 (BOL, K, PRE).
- 2730 (Vryheid): Wakkerstroom (-AC), *Beeton* sub SAM 12442 (SAM).
- O.F.S.—2727 (Kroonstad): Kroonstad (-CA), *Chennell* sub *Rogers* 93 (J, K); about 6 km N of Kroonstad on Johannesburg road, *Scheepers* 1279 (K, PRE).
- 2827 (Winburg): About 15 km W of Winburg by Ventersburg road (-CA), *Brenan* 14096 (K).
- 2926 (Bloemfontein): Bloemfontein, Tempe Farm (-AA) *Potts* 2580 (K); Bloemfontein, Mazels Poort, *Steyn* 43 (NBG); Bloemfontein, O.F.S. Botanic Garden, *Müller* 281 (NBG, PRE); Bloemfontein, O.F.S. Botanic Garden, *Müller* 535 (NBG, PRE).
- SWAZILAND—2631 (Mbabane): Mbabane (-AC), *Nicholson* 17 (K, PRE).
- NATAL—2732 (Ubombo): Lebombo Mountains, Jozini Pass (-AC), *Brenan & Vahrmeijer* 14187 (K, PRE).
- 2830 (Dundee): Wasbank (-AC), *Strey* 8473 (E, K, PRE).
- 2929 (Underberg): Mpendle (Impendhle) (-DB), *Huntley* 482 (PRE).
- 2930 (Pietermaritzburg): Pietermaritzburg (-CB), *Wilms* 2339 (BM, K); Pietermaritzburg, Rushbrook, *de Villiers* 26 (E).
- 2931 (Stanger): Durban Bayhead (-CC), *Ward* 5114, 5116 (K, PRE).
- Grid references unknown: Mooi River (-?), *Johnston* 289 (E); Mooi R., *Medley Wood* 4440 (K); Zululand, Zabamhlofe Res. Station, *West* 722 (L).
- LESOTHO—2828 (Bethlehem): Leribe (-CC), *Dieterlen* 162 (K, PRE, SAM), *Phillips* 516 sub SAM 6292 (SAM).
- 2927 (Maseru): Roma, *Schmitz* 285 (PRE).
- Grid reference unknown: *Cooper* 3048 (K).
- CAPE—2723 (Kuruman): Batlaros (-AC), *Silk* 213 (K, PRE).
- 2824 (Kimberley): Barkley West, Newlands (-DA), *Wilman* sub KMG 3082 (K).
- 2922 (Prieska): Prieska, Golhurt (?) *Bryant* 47 (K).
- 3126 (Queenstown): Queenstown (-DD), *Galpin* 2039 (K), Buffelsfontein (-BC), *Stretton* 208 (PRE).

- 3219 (Wuppertal): Cedarberg, Matjesrivier (-AC), *Wagener* 324, 325 pro parte (NBG).
- 3224 (Graaff-Reinet): Graaff-Reinet (-BC), *Thornton* 202, 203 (K).
- 3226 (Fort Beaufort): Shiloh (-BB), *Baur* 945 (K); Peffers Kop (-DB), *Acoccks* 9749 (L, PRE).
- 3318 (Cape Town): Stellenbosch (-DD), *Duthie* 1460 (BOL); Mowbray (-CD), *Garside* 6159 (BOL); Stellenbosch, Onderpapegaaienberg (-DD), *Taylor* 5651 (K).
- 3319 (Worcester): Karoo Garden, Worcester, weed (-CB), *Brenan* 14045 (K).
- 3321 (Ladysmith): Assegaaibos (-DA), *Fourcade* 5987 (NBG).
- 3323 (Willowmore): Uniondale, Olifants River Warm Baths (-?), *Fourcade* 4957 (K).
- 3325 (Port Elizabeth): Port Elizabeth (-DC), *Laidieu* (?) s.n. (L).
- 3326 (Grahamstown): Grahamstown (-BC), *MacOwan* 3416 sub SAM 153 (SAM); Grahamstown, (-BC), sub GRA 2416 s.n. (K).
- 3327 (Stutterheim): Komga (-DB), *Flanagan* 734, 735 (PRE, SAM).
- 3418 (Simonstown): "Prom. b. spei" (-AD), *Nelson* (BM); Constantia, Bergvliet Farm (-AB), *Purcell* 328 sub SAM 89800 (SAM); Houtbaai (Hout Bay), *Adamson* 807 (BOL); Somerset West (-BB), *Parker* 3470 (BOL, K, NBG).

A. hybridus subsp. *hybridus* is widespread in the tropics and subtropics of the world, usually a weed but sometimes a pioneer in open disturbed ground. It is also a frequent casual in temperate regions, including Europe. It is grown as a grain crop in Asia and America and not infrequently as a decorative plant on account of its red or yellow inflorescence.

A. hybridus subsp. *hybridus* is probably the most widespread amaranth in South Africa, ranging from Cape Town northwards. It is usually a weed of disturbed or cultivated ground and extends from near sea-level to c. 1 800 m. In places it is common—sometimes too common: *Thornton* 202 from Graaff-Reinet notes that it is called "Hells Curse"!

Typical *A. hybridus* subsp. *hybridus* has green inflorescences. However, forms with bright red inflorescences occur which can be called var. *erythrostachys* Moq. in DC., Prodr. 13, 2: 259 (1849). This includes *A. hypochondriacus* L., Sp. Pl. 991 (1753) which Sauer in Ann. Miss. Bot. Gard. 54, 2: 103–137 (1967) regards (in my view unjustifiably) as a distinct species.

Unfortunately the red colour of var. *erythrostachys* Moq. quickly disappears from dried specimens and thus in the absence of notes it may be impossible to identify it with any certainty in the herbarium. From the available field-notes and from personal field observation in South Africa *A. hybridus* subsp. *hybridus*

generally has green inflorescences. But var. *erythrostachys* does occur, though it is clearly uncommon. The certain records are indicated in the citations below. "A. paniculatus L." of Adamson in Adamson & Salter, Fl. Cape Penins.: 360 (1950) may refer to var. *erythrostachys* and is probably based on Adamson 3560 (BOL!) from Rondebosch.

The name *A. caudatus* has been sometimes used on herbarium specimens from South Africa, and occasionally in print, e.g. in Henderson & Anderson, Common Weeds S. Afr. 108 (1966). It is probable that most if not all material named *A. caudatus* in South Africa is referable to *A. hybridus* L. subsp. *hybridus* var. *erythrostachys* Moq. or to *A. hybridus* L. subsp. *cruentus* (L.) Thell. True *A. caudatus* L. is a distinct species often grown in European gardens under the name "Love lies bleeding" and may well occur as a garden plant in South Africa. It is close to *A. hybridus* but has pendulous tail-like red inflorescences and the perianth-segments of the ♀ flowers obovate to broadly spatulate and distinctly imbricate.

The following specimens are those certainly referable to var. *erythrostachys*:

BOTSWANA—2125 (Lothlekane): Lothlekane (-AD), Allen 89 (J, PRE).

TRANSVAAL—2329 (Pietersburg): Pietersburg (-CD), McCallum 137 (PRE); Bandelierkop (-BD), Pole Evans 4804 (42) (PRE).

—2528 (Pretoria): Irene (-CC), Pole Evans 4804 (43) (PRE); Villieria, 27th Ave., 640 (-CA), du Plessis s.n. (PRE); Pretoria (-CA), Kluge 18 (PRE).

—2629 (Bethal); Standerton, Berginsel Farm (-CD), Burt Davy 1805 (PRE).

NATAL—2930 (Pietermaritzburg): Pietermaritzburg, Boulder Hill Game Farm (-CB), Stirton 382 (K).

—3030 (Port Shepstone): Alexandra District, Dumisa, Farm Friedenau (-AD), Rudatis 344 (BM, K).

CAPE—3026 (Aliwal North): Aliwal (-DA), Gerstner 240 (PRE).

—3228 (Butterworth): Kentani (-CB), Pegler 729 (PRE).

—3318 (Cape Town): Rondebosch (-CD), Adamson 3560 (BOL) (Identity probable but doubtful).

—3327 (Peggie): East London (-BB), Ratray 1296 (PRE).

—3527 (Stutterheim): Komga (-DB), Flanagan 735 (PRE).

Indeed typical subsp. *hybridus* is generally remarkably uniform in South Africa, suggesting that it is a comparatively recent introduction, in spite of its frequency and range.

Only two aberrations are worthy of note. Firstly two specimens, one from Natal [-2930 (Pietermaritzburg): Pietermaritzburg, Alexandra Park (-CB), Bot. Dept. Natal University College 101 (K, PRE)] and one from the Transvaal [-2330 (Tzaneen): Tzaneen, Rouman (-CC), Papendorf 397 (PRE)], show the ultimate axes of the flower-clusters (usually so abbreviated as to be scarcely

visible) elongate up to about 5 mm. The main clusters or "spikes" of the inflorescence thus appear to be made up of densely aggregated "spikelets" along which the flowers are closely set. I have seen similar plants from East Africa and they are best regarded for the present as casual abnormalities of subsp. *hybridus**.

Secondly, a few specimens apparently of *A. hybridus* subsp. *hybridus* are abnormally strongly hairy on the stem, petioles and principal vasculature of the leaves beneath. Usually *A. hybridus* is characteristically very weakly hairy, and these more hairy specimens, few in number and scattered in their distribution may represent the products of introgression from *A. retroflexus*. This hybrid is well known in Europe, but not so far from South Africa. Careful observation is needed in the field to clarify the taxonomic status of these specimens, which are as follows:

- CAPE—3128 (Umtata): Nqeleni (-DB), *Strey 11172* (K).
— 3226 (Fort Beaufort): Balfour (-DA), *Moore 22* (PRE).
NATAL—2930 (Pietermaritzburg): Isipingo North (-DD), *Ward 6524* (K, PRE).

In some respects these specimens are also reminiscent of European material named *A. quitensis* H.B.K., a native of S. America very close to *A. hybridus* but with spathulate-obtuse ♀ perianth-segments. As the South African material is in young flower, its possible identity with *A. quitensis* cannot be dismissed.

It is of interest that *A. hybridus* subsp. *hybridus* remains have been recorded (under the name *A. paniculatus* L.) from Scott's Cave, a Later Stone Age site in the Gamtoos Valley WNW. of Port Elizabeth [M. J. Wells in S. Afr. Arch. Bull. 20, 78 (2): 80–84 (1965)]. The cave was probably occupied between 1500 and 1790 A.D., before European penetration of the area, though an introduced amaranth may well have reached the area beforehand. At least this discovery is testimony to the relative antiquity of *A. hybridus*, even as a weed, in South Africa.

* Further material of this taxon from elsewhere has recently become available: Zimbabwe, cult. at Salisbury, *VS 118*, *VS 110*; India, Khasra, Chotandaipur, 16 Oct. 1969, *D. N. Thakur DNT 512*. Its peculiarities are maintained, but its taxonomic position made even more puzzling. The inflorescences are very long and tail-like, up to about 550 mm, interrupted below. The elongate bracteoles much exceed the flowers (cf. *A. albus* L.). The ♀ perianth-segments in the mature Indian specimen become obovate, rounded and minutely apiculate at apex, and white except for the green midrib. There is here some resemblance to *A. retroflexus*, but the inflorescences, both whole and partial are very different, and the indumentum of *A. retroflexus* is lacking. More material and observation are much needed.

subsp. *cruentus* (L.) Thell., Fl. Adv. Montpellier 205 (1912); C. C. Townsend in Nasir & Ali, Fl. W. Pakistan 71: 12 (1974) & in Publ. Cairo Univ. Herb. 7-8: 64-66 (1977).

A. cruentus L., Syst. Nat., ed. 10, 1269 (1759); Sauer in Ann. Miss. Bot. Gard. 37: 601, fig. 5 (p. 598) (1950); Henderson & Anderson, Common Weeds S. Afr. 108 (1966); Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwest-afr. 33 Amaranthaceae: 7 (1966). Type: Herb. Linnaeus 1117/25 (LINN, lecto-type).

Larger bracteoles of ♀ flowers about as long as to $1\frac{1}{2}$ times as long as the perianth. Upper part of fruit (including style-bases) short, firm, not "beaked" inflated or wrinkled.

BOTSWANA—N:—1922 (Nokaneng): Mutsoi, NE of Nokaneng (-CA), *Lambrecht* 110 (K); N: Thaoge R. bank at Sehlabakgetse, 19° 24'S, 22° 11.3'E, *Smith* 1695 (K).

SE:—2425 (Gaborone): Gaborone campus (-DB), *Mott* 179d (K); Gaborone, Broadhurst, *Hansen* 3095 (K).

TRANSVAAL—2330 (Tzaneen): Modjadjis near Duivelskloof (-CB), *Krige* 170 (PRE); by road en route to Politsi (-CC), *Scheepers* 267 (K); roadside Levubu—Albasini Dam (-AB), *Brenan* 14174 (K, NBG, PRE).

—2628 (Johannesburg): Johannesburg, Milner Park (-AA), *Moss* 6676 (J).

NATAL—2930 (Pietermaritzburg): Isipingo Beach (-DD), *Ward* 6533 (PRE).

—2931 (Stanger): Durban, Bayhead (-?), *Ward* 5119 (PRE).

The taxonomy of *A. hybridus* presents considerable problems. Thellung in his fine account of the genus in Ascherson and Graebner's *Synopsis der Mitteleuropäischen Flora* 5, 1 (1914) adopted a "wide" view of the limits of the species, which I followed in my account of the British species in *Watsonia* 4, 6: 267-269 (1961). However, Sauer in his valuable account of the grain amaranths and their relatives in Ann. Miss. Bot. Gard. 54, 2: 103-137 (1967) put forward a very different opinion, recognising as distinct four species that had been amalgamated in Thellung's account: *A. hybridus* L., *A. powellii* S. Wats. in Proc. Amer. Acad. 10: 347 (1875), *A. hypochondriacus* L. and *A. cruentus* L. There is no doubt that the four species as defined by Sauer encompass a wide range of plants often with spectacular differences of colour, size and form and that these are frequently genetically controlled.

The problem has been recently carefully and critically reassessed by Townsend in Publ. Cairo Herb. 7-8: 64-66 (1977) and I have re-examined the wide range of material myself. I can only follow Townsend in maintaining a "wide" concept of *A. hybridus* and I accept his verdict that what I called in 1961 *A. hybridus* subsp. *incurvatus* (Timeroy ex Gren. and Godr.) Brenan should cor-

rectly be subsp. *cruentus*. I am very grateful to Mr C. C. Townsend for help and advice on this complex matter.

2. *Amaranthus retroflexus* L., Sp. Pl. 991 (1753); Cooke & Wright in Thiselton-Dyer, Fl. Cap. 5, 1: 410 (1910); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 254 (1914); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 485, t.95, fig. 5, 5a, c-e, fig. 209 (p. 470), fig. 241 (p. 486), fig. 242 l-r (p. 505) (1959); Brenan in Watsonia 4, 6: 270 (1961). Type: cultivated at Uppsala, Herb. Linnaeus 1117/22 (LINN, lectotype).

Annual. *Main stem* erect, usually with ascending branches, up to about 1 m high, but often much less, $\pm$ densely clothed with short crisped pubescence, especially above. *Leaves* with petioles mostly long, 15–80 mm long; axils without spines; lamina ovate to elliptic or oblong-ovate, often slightly rhombic, mostly 30–90 (–150) mm long, 15–40 (–65) mm wide, shortly hairy especially on midrib and main nerves beneath, much less so above, cuneate-attenuate at base, obtuse to subacute at apex, sometimes slightly emarginate and mucronate as well, green and without darker blotches. *Inflorescence* greenish-white, of dense rather thick terminal and axillary spikes which are themselves usually shortly branched, the spikes thus lobed and forming dense terminal and axillary panicles; elongate cylindrical spiciform branches absent. *Bracteoles* subequalling to twice as long as the flowers. σ^7 *flowers* few, mainly towards ends of branches, with 5 oblong-elliptic perianth-segments. f *flowers* with 5 oblong-spathulate to spatulate perianth-segments about 1.75–2.75 mm long, whitish with green midrib becoming colourless and apparently disappearing below the rounded or emarginate and often mucronate apex. *Stigmas* 0.5–0.75 mm long. *Fruit* shorter than the perianth, circumscissile, smooth. *Seed* very glossy, blackish-brown, 1–1.25 mm in diameter; surface smooth or very faintly reticulate, not at all verrucose.

var. *retroflexus*; Brenan in Watsonia 4, 6: 270 (1961).

Longer bracteoles of f flowers about twice as long as the flowers.

NATAL—2930 (Pietermaritzburg): Durban, Merebank Central (-DD), *Baijnath* 224 (PRE).

CAPE—2824 (Kimberley): Kimberley, garden (-DB), *Bunting* sub McGregor Museum, Kimberley 1365 (BOL, K).

—3225 (Somerset East): Boschberg (-DC?), *MacOwan* 1957 (K).

var. *delilei* (Richter & Loret) Thell. in Vierteljahrsschr. N. G. Zürich 52: 442 (1907); Thell. in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 260 (1914); Aellen

in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 486 (1959); Brenan in *Watsonia* 4, 6: 271 (1961). Type from France.

Longer bracteoles of ♀ flowers about $1\frac{1}{3}$ – $1\frac{1}{2}$ as long as the flowers.

CAPE—3226 (Fort Beaufort): Shiloh (-BB), *Baur 1139* (K).

Native of North America and extending southwards to Mexico. An introduction in many parts of the world including Europe, North Africa, temperate Asia from Cyprus and Turkey to China and Japan, Australia, South America and South Africa. Occurs in more temperate regions than a number of related species.

A. retroflexus is very variable in size. Starved specimens in poor ground may flower and fruit when only a small number of millimetres high, but there is no evidence for regarding this variation as anything but phenotypic.

It is usually easily identified by its paniculate terminal as well as lateral inflorescence with a shortly lobed outline but without elongate tail-like branches, densely pubescent stems, female flowers with 5 spathulate perianth-segments, and by the circumscissile fruits.

3. *Amaranthus dubius* Mart. ex Thell., Fl. Adv. Montpellier 203 (1912); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 265 (1914); Aellen in Hegi, Ill. Fl. Mitteleur. ed. 2, 3, 2: 476, fig. 201 (p. 468) (1959). Type from tropical America.

Annual. *Main stem* erect, up to about (0,15–)0,3–1(–2) m high, with numerous branches, glabrous, or with some short pubescence near the inflorescence. *Leaves* with petiole very variable in length, but usually some, especially on main stems, long, 30–90 (sometimes –140) mm long; axils without spines; lamina usually ovate to elliptic, often somewhat rhombic, mostly 20–120 (sometimes –190) mm long, 13–70 (sometimes –125) mm wide, glabrous or subglabrous, attenuate at base itself but immediately above usually widening and rounded or broadly cuneate, obtuse or sometimes rounded and minutely mucronate and often slightly emarginate at apex, green and without darker blotches. *Inflorescence* a green, ± branched terminal panicle with leafless spiciform branches 20–180(–250) mm long, below often interrupted with ± numerous axillary flower-clusters; terminal parts of branches either with ♂ cymules or with ♂ and ♀ flowers mixed; middle part of branches often with cymules with both ♂ and ♀; basal part wholly or predominantly ♀. *Bracteoles* about as long as or slightly longer than the flowers. ♂ *flowers* with 5 ovate-subacuminate perianth-segments. ♀ *flowers* with 5 oblong-spathulate perianth-segments about 1,5–2,5 mm long, whitish with green midrib, rounded and often very shortly mucronate at apex. *Stigmas* 0,5–1,0 mm long. *Fruit* about as long as or slightly shorter than the perianth, circumscissile, not closely and regularly rugose. *Seed* very glossy,

chestnut-black, 0.8–1 mm in diameter; surface very faintly reticulate, almost smooth, the areolae slightly smaller in comparison with the mesh.

Native of tropical America. Widespread but introduced in tropical Africa. Occasionally adventive in Europe (Aellen, 1959).

NATAL—2930 (Pietermaritzburg): Durban Merebank East (-DD), Ward 5385 (PRE); Isipingo North, Ward 6523 (K, PRE).

—2931 (Stanger): Inanda, Tongaat (-CA), Ramasamy 27 (PRE); Durban (-CC), Ward 5117 (K, PRE).

CAPE—3129 (Port St. Johns): Port St. Johns (-DA), Moss 4348 p.p. (BM, J).

As Thellung (1914) pointed out, *A. dubius* is most closely related to *A. spinosus*, differing in the constant absence of axillary spines as well as in other characters. Although not a constant difference, and with some degree of overlap, the leaves of *A. dubius* are usually broader and generally ovate rather than lanceolate in outline; the ♀ perianth-segments have often wider white margins and are more rounded and less mucronate at apex; the stigmas are also shorter. Hybrids between the two have been reported (see Thellung, 1914), though not from South Africa; they are apparently rare and as *A. dubius* is the only known polyploid species of *Amaranthus* (see Sauer, 1967) likely to be largely sterile.

Sauer in *Ann. Miss. Bot. Gard.* **54**: 106 (1967) keyed out *A. dubius* and *A. spinosus* by the distribution of the ♂ and ♀ flowers, as well as by the presence or absence of spines. He stated that *A. spinosus* has the lower cymules ♀, the upper ♂, while *A. dubius* has each cyme with a terminal ♂ flower and the rest ♀. The statement is true for *A. spinosus*, but the distribution of the sexes in *A. dubius* is much less constant, sometimes as was described by Sauer but sometimes barely distinguishable from *A. spinosus*. Generally, however, there is a greater tendency for cymules of mixed sex in *A. dubius*.

4. *Amaranthus spinosus* L., Sp. Pl. 991 (1753); Cooke & Wright in Thiselton-Dyer, Fl. Cap. **5**, 1: 409 (1910); Thellung in Asch. & Graebn., Syn. Mittleleur. Fl. **5**, 1:267 (1914); Burtt Davy, Fl. Transv. 180 (1926); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, **3**, 2: 477, fig. 202 (p. 468) (1959); Brenan in Watsonia **4**, 6: 271 (1961); Henderson & Anderson, Common Weeds S. Afr. 110, fig. 54 (1966); Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr., 33 *Amaranthaceae*: 9 (1966); Ross, Fl. Natal 158 (1972). Type cultivated at Uppsala, Herb. Linnaeus 1117/27 (LINN, lectotype).

Annual. Main stem erect, up to about 0.3–1.5 m high, with numerous branches, glabrous, or with some short pubescence near the inflorescence. *Leaves* with petiole very variable in length, but usually some, especially on main stems. long, 30–70 (–90) mm; axils nearly always with 2(–4) divaricate spines about

5–15 (–25) mm long, green with straw-coloured tip; lamina ovate to lanceolate or oblong, often somewhat rhombic, 20–80 mm long, 7–30 mm wide, glabrous or subglabrous, attenuate at base, obtuse or slightly emarginate and minutely mucronate at apex, green and without darker blotches. *Inflorescence* a green, $\pm$ branched terminal panicle with leafless spiciform branches 20–150 mm long, below interrupted with $\pm$ numerous axillary flower-clusters; terminal parts of branches with σ cymes, lower and axillary cymes φ , the latter often with spines. *Bracteoles* rather shorter than to about as long as flowers. σ flowers with 5 ovate-subacuminate perianth-segments. φ flowers with 5 oblong-spathulate perianth-segments about 1–2,5 mm long, whitish with green midrib, rounded to sometimes subacute and very shortly mucronate at apex. *Fruit* about as long as or shorter than the perianth, not closely and regularly rugose; lid clearly defined but often not opening. *Stigmas* 0,75–1,5 mm long. *Seed* very glossy, deep, chestnut-brown to blackish, about 0,7–1 mm in diameter; surface smooth or only slightly roughened, not closely and regularly reticulate.

A pantropical weed, probably originating in tropical America.

BOTSWANA—N:—1824 (Kachikau): Kachikau (-AB), *Munro ML 10* (K, PRE).

—N:—1923 (Maun): Maun (-CD), *Lambrecht 238* (K, PRE).

—SE:—2425 (Gaborone): Gaborone, The Mall, *Hansen 3421* (PRE).

—2426 (Mochudi): Mochudi, Phutodikobo Hill (-AC), *Naomi Mitchison 68* (K).

S.W.A.—2116 (Okahandja): Okahandja, Farm Quickborn (-DD), *Bradfield 420* (PRE).

—2217 (Windhoek): Windhoek (-CA), *Giess 10551* (PRE).

TRANSVAAL—2330 (Tzaneen): Duiwelskloof (-CA), *Davidson 1/75* (NBG); Letaba (-CD), *Scheepers 644* (K, PRE).

—2430 (Pilgrim's Rest): Shiluvane (-AB), *Junod 1062* (K).

—2526 (Zeerust): Zeerust (-CA), *Pott 4347* sub SAM 9503 (SAM).

—2527 (Rustenburg): Rustenburg (-CA), *Nation 122* (BOL, K).

—2528 (Pretoria): Pretoria (-CA), *Leendertz 7* (K, PRE), *Burt Davy 1072* (K, PRE); Pretoria, Corellilaan, Les Marais, *Hanekom 1325* (K).

—2530 (Lydenburg): Waterval Boven (-CB), *Burt Davy 1548* (K, PRE); Lowveld Botanic Garden (-BD), *van Jaarsveld 245* (NBG, PRE).

—2531 (Komatiport): Barberton (-CC), *Burt Davy 300* (BOL, PRE).

Grid reference unknown: The Downs (?), *Moss & Rogers 267* (BM).

NATAL—2829 (Harrismith): Winterton (-DC), *Harding 843* (K).

—2930 (Pietermaritzburg): Camperdown, Nagle Dam (-DA), *Wells 1120* (E, K); Durban, N end of Berea Ridge (-DD), *Galpin s.n.* (NBG), *Galpin 12102* (K, PRE).

—2931 (Stanger): near Durban (-DD), *Medley Wood 1762* (BOL, K), *Wilms 22381* (BM, K, PRE) (BM sheet 2238!), *Theron 805* (K, PRE); Durban, Bluff (-CC), *Pillans* sub SAM 16556 (SAM).

—3030 (Port Shepstone): *Ixopo* (-AA), *Schlechter 6679* (K).

CAPE—3129 (Port St. Johns): Port St. Johns (-DA), *Mogg 13147* (K, PRE).

A. spinosus is very easily recognised from all other species in the genus by the presence of obvious axillary spines. Although Thellung (1914) mentions unarmed or almost unarmed variants, such have not been found in South Africa and are anyhow more likely to be hybrids between *A. spinosus* and *A. dubius* (see also Sauer, 1967). For the differences between these two species, see under *A. dubius* (p. 464).

5. *Amaranthus thunbergii* Moq. in DC., Prodr. 13, 2: 262 (1849); Cooke & Wright in Thiselton-Dyer, Fl. Cap. 5, 1: 410 (1910) pro max. parte, excl. *Baur 971* & verisim. *Burt Davy 1802*; Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 280 (1914); Burt Davy, Fl. Transv. 181 (1926); Adamson in Jl S. Afr. Bot. 2, 4: 193 (1936); Adamson in Adamson & Salter, Fl. Cape Penins. 361 (1950); Aellen in Hegi, Ill. Fl. Mitteleur. ed. 2, 3, 2: 496, fig. 223 (p. 471) (1959); Brenan in Watsonia 4, 6: 271 (1961); Henderson & Anderson, Common Weeds S. Afr. 112, fig. 55 (1966); Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr., 33 Amaranthaceae: 8 (1966), pro parte—vide *A. praetermissum*; Ross, Fl. Natal 158 (1972). Type (see notes below, p. 470): South Africa, Herb. Thunberg negative No. 933, exposure No. 6 (VRS, isosyntype).

Annual. *Stems* decumbent or erect, 70 mm to 1 m high, $\pm$ branched especially below but sometimes throughout, when young $\pm$ pubescent (sometimes sparsely) with crisped elongate hairs. *Leaves* with petiole 3–40 mm long, variable in length on a single plant; axils without spines; lamina obovate-elliptic to obovate or rarely oblanceolate, sometimes almost elliptic, mostly 10–16 mm long, 5–30 mm. wide, glabrous or subglabrous, attenuate or cuneate-attenuate at base, often $\pm$ narrowed above to an obtuse or rounded or sometimes slightly emarginate apex, sometimes rounded above, green or sometimes with a purplish central blotch. *Inflorescence* of dense axillary clusters extending to near base of stem, clusters often confluent above; inflorescence leafy throughout. *Bracteoles* lanceolate, shorter than perianth. σ^7 *flowers* with 3 ovate-elliptic perianth-segments with a conspicuous awn-like spreading or somewhat curved outwards (but not uncinat) point 0.5–1 mm long; *anthers* exserted, 1.5 mm long. f *flowers* with (in fruit) 3 unequal, ovate-oblong to lanceolate perianth-segments 3–5 mm long, with greenish midrib usually not or scarcely branched above and not or slightly thickened, gradually acute at apex and narrowed to a fine suberect or $\pm$ spreading awn-like point 0.75–2 mm long. *Stigmas* 0.75–1 mm long. *Fruit* ellipsoid-ovoid, shorter than perianth, circumscissile, smooth or slightly rugose

above. *Seed* ellipsoid-rounded, glossy, blackish, 1–1.25 mm in diameter, minutely roughened and very finely impressed-reticulate on surface.

A. thunbergii is rather widespread in Africa, from South Africa northwards through East Africa to Uganda and Somalia, in the west extending to Zambia and Angola.

BOTSWANA—N:—2124 (Rakops): Botletle R., Toromoja (-BA), *Sampson* 57 (K), *Ngoni* 436 (K, PRE); N: Boteti R. and Samedupe Bridge, 20° 06.7' S., 23° 31.6' E., *Smith* 1840 (K); N: Lake Ngami, 20° 26' S., 22° 59.75' E., *Smith* 1919 (K, PRE).

SW:—2121 (Ghanzi): Ghanzi (-DA), *Brown s.n.* (K).

SW:—2622 (Tsabong): Ditatso Pan 40 km. N.W. of Tsabong (-AB), *Leistner* 3061 (EAH, PRE).

SE:—2425 (Gaborone): Gaborone campus (-DB), *Mott* 827 (K, PRE).

—2426 (Mochudi): Mochudi (-AC), *Harbor* sub *Rogers* 6442 (J, K).

S.W.A.—1715 (Ondangua): E of Oshikango (-BD), *Rodin* 9049 (K, PRE).

—1719 (Runtu): Kapako Camp E of Mupini (-DC), *de Winter & Marais* 4499 (K).

—1813 (Ohopoho): Kaoko Otavi (-BC), *de Winter & Leistner* 5589 (K).

—2016 (Otjiwarongo): Omatjenne (-AD), *Volk* 2939 (K).

—2116 (Okahandja): Okahandja (-DD), *Dinter* 147 sub SAM 70760 (SAM).

—2214 (Swakopmund): Haikamchab (-DB), *Galpin & Pearson* 7453 (K).

—2818 (Warmbad): Sandfontein (-DA), *Wilman s.n.* (K).

Grid reference uncertain: W of Kalkfontein, *Range* 1390 sub SAM 70763 (SAM).

TRANSVAAL—2330 (Messina): Messina (-AC), *Rogers* 20853 (J).

—2430 (Pilgrim's Rest): Sekhukuniland, Driekop (-CA), *Mogg & Barnard* 607 (K, PRE).

—2528 (Pretoria): Pretoria (-CA), *Leendertz* 10413 (K, PRE); Pretoria, Corellilaan, Les Marais, *Hanekom* 1332 (K, PRE).

—2531 (Komatipoort): Barberton (-CC), *Rogers* 18356 (K), *Cotton Exp. Station* 27 (K).

—2627 (Potchefstroom): Potchefstroom Farm (-CA), *Burt Davy* 1051 (BOL, K, PRE), 1057 (K).

—2628 (Johannesburg): Johannesburg, Forest Town (-AA), *Moss* 9321 (BM, J); Pretoria, Birchleigh, *Moss* 14402 (BM, J).

—2725 (Bloemhof): Schweizer Reneke, Vierfontein (-AB), *Burt Davy* 1683 (PRE); Bloemhof, S.A. Lombard Nature Reserve (-DA), *Leistner* 47 (K).

Grid references unknown: Marico District, *Holub s.n.* (K); Springbok Flats, *Burt Davy* 1740 (K, PRE); "P.P. Rust", *Leendertz* 1939 (K).

O.F.S.—2827 (Winburg): 15 km. W of Winburg on Ventersburg road (-CA), *Brenan* 14097 (K, PRE), *Brenan* 14098 (K).

- 2926 (Bloemfontein): Bloemfontein (-AA), *Potts* 635 (L).
 SWAZILAND—2531 (Komatipoort): Tshaneni (-DC), *Barrett* 199 (PRE).
 NATAL—2732 (Ubombo): Sordwana Bay (-DA), *Brenan & Vahrmeijer* 14227 (K, PRE).
 —2832 (Mtubatuba): Hlabisa District, Hluhluwe Game Reserve (-AA), *Ward* 4780 (K, PRE).
 —2929 (Underberg): Tabamhlope (-BA), *West* 982 (K, PRE).
 —2930 (Pietermaritzburg): Inanda (-DB), *Wood s.n.* (K).
 LESOTHO—2828 (Bethlehem): Leribe (-CC), *Dieterlen* 524, 995 (K, PRE, SAM).
 —2927 (Maseru): Roma, University Campus (-BC), *Schmitz* 1467, 6347 (PRE).
 Grid references unknown: *Cooper* 186 (K), 3049 (K).
 CAPE—2624 (Vryburg): Vryburg, Armoedsvlakte (-DC), *Mogg* 8243 (L).
 —2723 (Kuruman): Takoon (-BB), *Burchell* "ex S 212 Cat. Geogr. 2221-2" (K); Albert District (-BC), *Cooper* 789 (E (p.p.)), (mixed with *A. capensis*).
 —2824 (Kimberley): Kimberley (-DD), *Moran s.n.* p.p. (NBG), *Wilman s.n.* (K); Witpan (-?), *Wilman s.n.* (K).
 —3022 (Carnarvon): Krantzfontein (-BC), *Wilman s.n.* (K).
 —3123 (Victoria West): Murraysburg (-DD), *Tyson* 51 p.p. sub SAM 43406 (SAM).
 —3318 (Cape Town): Cape Town (-CD), *Herb. A. Prior s.n.* (K); Claremont *Schlechter* 275 (BM, PRE), 278 (K); Groote Schuur (-CD), *Wolley Dod* 1142 (BM, BOL, K); Rondebosch, *Adamson* 2357 (BOL); Rondebosch, Sandown Road, *Wolley Dod* 2483 (BM); Stellenbosch (-DD), *Moss* 4349 (BM, J); Jonkershoek, *Parker* 4559 (K, NBG).
 —3322 (Oudtshoorn): Farm Doornkraal de Rust (-?), *Dahlstrand* 2455 (J, PRE).
 —3224 (Graaff-Reinet): Graaff-Reinet (-BC), *MacOwan* 357 (K), *Bolus* 357 (BOL, K, PRE).
 —3324 (Steytlerville): Uitenhage, near the Zwartkopsrivier (-DB), *Zeyher* 576 (BM, BOL, K, NBG, PRE, SAM), *Zeyher* 3611 (NBG, SAM).
 —3325 (Port Elizabeth): Uitenhage (-CD), *Herb. A. Prior s.n.* (K).
 —3326 (Grahamstown): Grahamstown (-BC), *Glass* 360 (NBG).
 —3418 (Simonstown): Cape Town, between Lakeside and Poll's Moor, E end of Westlake Golf Course (-AB), *Brenan* 14023A (K, MO, NBG, PRE); Bergvliet Farm, Constantia, *Purcell s.n.* (SAM); "Promont. b. spei" (-AD), *B.S.* 1771 (BM); Somerset West (-BB), *Parker* 3480 (BOL, K, NBG); Cape Peninsula, Edinburgh Estate, bed of Liesbeck R. (-?), *Salter* 9012 (BOL).
 Grid references unknown: *Drège s.n.* (BM, E, K), *Ecklon & Zeyher* 2, 3 (K), *Fraser s.n.* (E), *Scott Elliot* 662 (E); "C.B.S.", *Pappe s.n.* (K); "In ruderalis hortis ubique", *Pappe* sub SAM 19200 (SAM).

According to a letter dated 17 October 1913 from Thellung to Stapf, preserved in the Kew Herbarium, a search of likely herbaria had failed to reveal any authentic material of *A. thunbergii*, except for a sheet of Zeyher 576 in Hooker's herbarium at Kew annotated as *A. thunbergii* in Moquin's own hand.

Moquin (*l.c.*) based the species on material from "Ad caput Bonae-spei (Thunb. herb. Hook.! Krauss!)". There is no Thunberg specimen in the Hooker Herbarium at Kew, and it seems at least possible that three entities are meant in Moquin's citation, though it seems puzzling that there is no exclamation-mark after "Thunb.", and perhaps it was omitted in error.

I am much indebted to Mr C. C. Townsend for information and advice here, and am content to follow his opinion that the specimen in Thunberg's own herbarium at Lund (IDC microfiche, negative No. 933, exposure No. 6), whose identity is beyond doubt, might be reasonably accepted as an isosyntype of the species.

Usually *A. thunbergii* is readily separable from *A. dinteri* by the presence of long hairs (sometimes sparse) on the young stems at least, the leaves usually more narrowed towards apex, and the fine awn-like part to the ♀ perianth-segments mostly 1 mm long or more in fruit. In addition the segments generally appear whitish with a green midrib, usually lacking the network of branched green venation in the upper part so often seen in *A. dinteri*.

Occasionally plants occur referable in my view to *A. thunbergii* but showing trends towards *A. dinteri*. For example Volk 2939 and de Winter & Leistner 5589 (South-West Africa) and Leendertz 10413 (Pretoria) are typical *A. thunbergii* except for the midrib of the ♀ perianth-segments being more thickened above and sometimes with an expanded area of green venation. An unnumbered Wilman specimen (Prieska, Mar. 1934) shows similar trends and is almost glabrous even on the young stems. A specimen at Kew (Herb. Prior *s.n.*, Cape Town) is similar to *A. thunbergii* except for the short awns (mostly 0.5–0.75 mm long, sometimes 1 mm).

A. thunbergii and *A. dinteri* are usually quite distinct from one another, but these occasional perplexing plants occur. Their taxonomic status is not certain, but it seems at present advisable to keep the two species distinct, but to admit the possibility of occasional hybridisation, as happens not infrequently elsewhere in the genus.

6. *Amaranthus dinteri* Schinz in Mém. Herb. Boiss. 20: 15 (1900); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 295 (1914); Adamson in Jl S. Afr. Bot. 2, 4: 193 (1936); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 502 (1959); Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr. 33 Amaranthaceae: 7 (1966). Type: South-West Africa, Salem, Dinter 129 (Z, holotype).

Annual. Stems decumbent or erect, about 100–400 mm long, usually much branched especially below, subglabrous when young or ± puberulous with short

straight or papilliform hairs, without pubescence of crisped elongate hairs. *Leaves* with petiole mostly 3–15 (–20) mm long, variable in length; axils without spines; lamina obovate to obovate-elliptic, mostly 5–25 (sometimes –30) mm long, 3–13 (sometimes –18) mm wide, glabrous or subglabrous, attenuate at base, obtuse to rounded and minutely mucronate and sometimes slightly emarginate at apex, wholly green or sometimes with a purplish central blotch. *Inflorescence* of dense axillary clusters extending to near base of stem; clusters often confluent above; inflorescence thus leafy throughout. *Bracteoles* lanceolate, shorter than perianth, often curved outwards or downwards. ♂ *flowers* with 3 elliptic to lanceolate, shortly acuminate perianth-segments; *anthers* only shortly exerted from flower, 0.5–1 mm long. ♀ *flowers* with 3 ovate to oblong perianth-segments 1.5–3.5 mm long, whitish with green midrib and often some venation above, acute or sometimes obtuse at apex, but mostly narrowed to a suberect or spreading acumen 0.1–0.5 (–0.75) mm long. *Stigmas* 0.5–0.75 mm long. *Fruit* ovoid to nearly round, shorter than to subequalling perianth, circumscissile, ± coarsely rugose above. *Seed* glossy, black or brownish-black, 1–1.5 mm in diameter; surface faintly reticulate and very finely roughened.

A. dinteri is restricted to South and South-West Africa, but occasionally introduced in Europe.

subsp. *dinteri*

Internodes variable in length, but those on the principal stems at least often comparatively long, 10–13 mm in length. Petiole variable but some at least 7–15 (–20) mm long. Leaf-lamina often 10–25 sometimes to 30 mm long.

The length of the female perianth-segments in subsp. *dinteri* is decidedly variable. The available material can be sorted into two groups which I provisionally call var. 'A' and var. 'B'. The great majority of specimens fall under 'A'. The taxonomic status of these two groups is very uncertain and needs further study in the field and cultivation and for that reason it seems wise not to give them formal recognition by names until their status has been more clarified.

Through the kindness of the Director of the Botanischer Garten und Museum der Universität Zürich, I have received on loan the type of *A. dinteri*, *Dinter 129*, a poor, stunted, apparently grazed specimen, but clearly belonging to the species as customarily understood and coming under var. 'A'.

var. 'A.'

Female perianth-segments in fruit 1.5–2.5 mm long, with acumen 0.1–0.5 mm long.

BOTSWANA—N:—2124 (Toromoja): Toromoja (-BA), *Anderson 1* sub *Peterhouse 160* (K). N: Mumpswe Pan, 40 km. NNW. of mouth of Nata R., *Drummond & Seagrief 5172* (K) (specimen doubtful).

SW—2421 (Tsane): Tsane Pan (-BB), *Wild* 5126 (K).

S.W.A.—1813 (Ohopoho): Kaoko Otavi (-BC), *de Winter & Leistner* 5589 (K).

—1814 (Otjitundua): Dolomietpunt (-C), *Le Roux* 897 (PRE).

—1915 (Okaukuejo): Adamax (-BA), *Le Roux* 696 (PRE); E of Sprokieswoud, *Le Roux* 823 (PRE).

—1920 (Tsumkwe): Tsumkwe (-DA), *Giess, Watt & Snyman* 11104 (PRE).

—2016 (Otjiwarongo): Otjiwarongo, S of Sukses (-BC), *Tölken & Hardy* 965 (K, PRE).

—2116 (Okahandja): Okahandja (-DD), *Dinter* 145 sub SAM 70758, 146 sub SAM 70759 (SAM), 235 sub SAM 70762 (SAM).

—2215 (Trekopje): Neuschwaben near Karibib (-BB), *Seydel* 1068 (K).

—2216 (Otjimbingwe): Otjozondou (Otjosondou) (-AA), *Seydel* 3373 (L).

—2314 (Sandwich Harbour): Tsondab Vlei (-?), *Jensen* 2331 (PRE).

—2616 (Aus): Kuibis (-DB), *Range* 827 sub SAM 70675 (SAM).

Grid reference unknown: Salem, Tsoachaubsand, 29 July 1898, *Dinter* 129 (Z, holotype).

TRANSVAAL—2725 (Bloemhof): Bloemhof, S.A. Lombard Nature Reserve (-DA), *Leistner* 47 (PRE).

Grid reference unknown: *Holub s.n.* (K).

O.F.S.—2926 (Bloemfontein): Bloemfontein (-AA), *Bolus s.n.* (BOL); Weed in Bloemfontein National Botanic Garden, *Brenan* 14093 (K, MO, NBG, PRE), 14094 (K).

CAPE—2520 (Mata Mata): Kalahari Gemsbok National Park, Kwang, Nosobrivier (-BA), *Barnard* 768 (PRE).

—2824 (Kimberley): 50 km. W of Douglas (-DB), *Compton* 23989 (NBG); Kimberley (-DD), *Moran s.n.*, p.p. (NBG).

—2921 (Kenhardt): Jagbult 64 km. W of Marydale (-DA), *Story* 1128 (PRE).

—2922 (Prieska): Prieska (-DA), *Bryant* 48 (K).

—3024 (De Aar): Rolfontein (-BB), *Jooste* 128 (PRE).

—3025 (Colesberg): about 14 km from Venterstad on Bethulie road (-DD), *Brenan* 14090 (K).

—3121 (Fraserburg): Fraserburg (-DC), *Bolus* 13435 (BOL).

—3125 (Steynsburg): Middelburg (-AC), *Theron* 83 (L, PRE); by Groote Vis R. on Spitskopvlei—Conway road NE of Graaff-Reinet (-CB), *Brenan* 14080 (K, NBG).

—3219 (Wuppertal): Cedarberg, Matjesrivier (-AC), *Wagener* 363, (NBG).

—3224 (Graaff-Reinet): Sunday's R. near Blue Gum House Farm (-DD), *Hilliard & Burt* 10701 (E); [Van] Ryneveld's Pass near Graaff-Reinet (-?), *Bolus* 360 (BOL).

—3321 (Ladysmith): Koup (-AB), *Compton 10399* (NBG).

Grid reference unknown: Grootfontein, *Rehmann s.n.* (K).

Without locality; *Krauss 777*, p.p. (K).

var. 'B'

Female perianth-segments in fruit 2.5–5 mm long.

S.W.A.—2218 (Gobabis): Gobabis, Farm Poortje (-BD), *Merxmüller & Giess 1147* (PRE).

—2317 (Rehoboth): N of Kalkrand on road to Rehoboth (-?), *de Winter 3509* (K, PRE).

—2718 (Grunau): Groot Karasberge, Wilmond (-BC), *Örtendahl (152) 459* (K, L).

CAPE—2723 (Kuruman): Albert (-BC), *Cooper 789* (K).

A. dinteri has been much misunderstood. In South Africa it has been confused with *A. thunbergii*, in spite of the careful distinctions drawn between the two species by Thellung in Ascherson and Graebner's *Synopsis der Mitteleuropäischen Flora* 5, 1 (1914). It has been equally misunderstood in Europe, mainly because it was not known as an adventive prior to 1914, and has only since then been recorded comparatively rarely in Germany and Sweden (Aellen in Hegi, *Illustrierte Flora von Mitteleuropa* ed. 2.3, 2: 503 (1959). I have collected it once in Britain [v.c. 30, Bedfordshire, Flitwick Station, 1 Oct. 1949, *Brenan & Dony 9757* (Herb. Brenan)]. The majority of the numerous European records of *A. dinteri* refer to var. *uncinatus* Thell. which, for reasons given on p. 477 is here considered to be specifically separate from *A. dinteri*.

A. dinteri, even after the exclusion of var. *uncinatus*, is decidedly variable especially in the size of the perianth. It seems useful at present to recognise two subspecies and the varieties mentioned above. Their status is nevertheless uncertain and it really requires experimental cultivation to bring any certainty, though the variation would seem to be in large part genetically controlled.

Le Roux 696 and *823* and *Brenan 14093*, cited above under var. 'A', and *de Winter & Leistner 5574*, cited above under var. 'B', show very clearly that the leaves have on their upper side an irregular often lobed or even compound purplish blotch. This has been named f. *maculatus* Probst & Thell. [ex Probst, *Dritter Beitr. Adventiv-und Ruderalfl. von Solothurn und Umgebung*, reprinted from *Mitteil. Naturf. Gesellsch. Solothurn* 8: 59 (1928), nomen nudum; et ex Hegi, *Ill. Fl. Mitteleur.*, ed. 2. 3, 2: 503 (1950), germanice tantum descripta], forma nova. Folia supra macula purpurea in medio ornata. This was originally based on an adventive plant in Europe (I have been so far unable to locate the type material), and is analogous to *A. thunbergii* f. *maculatus* Thell. In Bloemfontein National Botanic Garden I collected a copious gathering of *A. dinteri*

with blotched leaves (*Brenan 14093*) among which were a few plants with leaves wholly green (*Brenan 14094*), otherwise identical. This variation thus is of trivial importance.

subsp. **brevipetiolatus** Brenan, subsp. nov.

Internodia etiam caulium praecipuum omnia brevia, usque ad 7 (–10) mm longa. Petioli omnes breves, usque ad 7 mm longi. Laminae parvae, usque ad 8 mm longae et 4 mm latae.

Type: South Africa, Bloemfontein, *Brenan 14095* (K, holotype; NBG, PRE, isotypes).

Internodes even on the main stems all short, up to 7 (–10) mm long. Petiole always short, up to 7 mm long. Leaf-lamina small, up to 8 mm long and 4 mm wide.

O.F.S.—2926 (Bloemfontein): Bloemfontein National Botanic Garden (–AA), *Brenan 14095* (K, holotype; NBG, PRE, isotypes).

CAPE—2824 (Kimberley): Kimberley (–DB), *Wilman s.n.* (K).

The material available of subsp. *brevipetiolatus* is still inadequate either to give a full conception of this taxon or to be certain of its status. The uniformly short petioles are very distinctive, however. *Brenan 14095* was collected at Bloemfontein growing with subsp. *dinteri* but distinct and without intermediates. Further knowledge may well show it to be a separate species. *Leistner 2976* (O.F.S., Willem Pretorius Game Reserve) may well be subsp. *brevipetiolatus*, but has somewhat larger foliage. More material of this taxon is much desired.

7. *Amaranthus capensis* Thell. in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 293 (1914); Adamson in JI S. Afr. Bot. 2, 4:193 (1936); Adamson in Adamson & Salter, Fl. Cape Penins. 361 (1950); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 502, fig. 232 (p. 472) (1959). Type: South Africa, *Ecklon & Zeyher 88* (lectotype, not seen).

A. blitum sensu Cooke & Wright in Thiselton-Dyer, Fl. Cap. 5, 1:411 (1910), pro parte quoad *Galpin 2015*, *Bowker s.n.*, non L.

Annual. Stems prostrate, radiating from rootstock, 50–250 (–600) mm long, ± branched especially in basal part, ± puberulous when young at least with very short straight or papilliform hairs, without crisped or elongate pubescence. *Leaves* with petiole 10–13 (–23) mm long, mostly short or very short; axils without spines; lamina obovate, 3–20 mm long, 2–10 (–15) mm wide, glabrous or subglabrous, ± attenuate at base, rounded and sometimes slightly emarginate at apex with mucro absent or very minute, green without purple blotches, with conspicuously undulate margins. *Inflorescence* of small dense axillary clusters

extending to near base of stem, often $\pm$ confluent above; inflorescence thus leafy throughout. *Bracteoles* lanceolate to ovate-acuminate, shorter than perianth, with downwardly curved apex. ♂ *flowers* with $3 \pm$ ovate-elliptic shortly acuminate perianth-segments; *anthers* long-exserted, about 1–2 mm long. ♀ *flowers* with 3 unequal perianth-segments 2–5.5 mm long, variable in width (0.3–1 mm) $\pm$ broadened and often curved outwards or hooked above with a close green reticulum of veins, obtuse or subacute sometimes acute at apex with a minute deflexed apiculus c. 0.10–0.25 mm long, usually 1–2 segments markedly broader and greener above than the third or all lanceolate and subulate-acuminate. *Stigmas* 0.5–1 mm long. *Fruit* obovoid to subglobose, shorter than perianth, circumscissile, smooth to somewhat rugose above. *Seed* glossy, brownish-black, about 0.75–1.5 mm in diameter; surface faintly reticulate and very finely roughened.

subsp. **capensis**

Female perianth-segments (in fruit) unequal, about 2–3.5 mm long, obovate or spatulate, with 1–2 markedly broadened and green above with a minute apiculus 0.1–0.25 mm long, often curved outwards but not subulate-uncinate.

TRANSVAAL—2531 (Komatipoort): Barberton (-CC), *Thorncroft* 882 (BM).

CAPE—3025 (Colesberg): about 14 km from Venterstad on Bethulie road (-DD), *Brenan* 14089 (BOL, G, K, M, MO, NBG, PRE, UPS).

—3026 (Aliwal North): Nieuwe Hantom (-CC), *Drège* sub SAM 19199 (SAM).

—3121 (Fraserburg): near Fraserburg (-DC), *Bolus* 13435 p.p. (BOL).

—3124 (Hanover): Hanover (-AB), *Sim* 6259 (PRE) (doubtful).

—3125 (Steynsburg): about 18.5 km N of Middelburg (-AC), *Acocks* 15695 (K, PRE).

—3224 (Graaff-Reinet): Graaff-Reinet (-BC), *Zeyher* 3 sub SAM 19198 (SAM); by Camdeboo R. about 30 km S of Graaff-Reinet by the Aberdeen road (-AC), *Brenan* 14074 (K).

—3318 (Cape Town): Middelburg. Grootfontein (-DC), *du Toit* s.n. (PRE).

—3383 (Willowmore): Willowmore (-AD), *Theron* 907 (K).

—3324 (Steytlerville): Steytleville (-AD), *Compton* 20309 (NBG).

—3418 (Simonstown): "Somerset" (?-BB), *Bowker* s.n. (K).

Grid references unknown: between Cape and Grahamstown, Ward 38 (E); Karieboomfontein, *Pearson* 3923 sub SAM 28373 (SAM).

subsp. **uncinatus** (Thell.) Brenan, comb. nov.

A. dinteri Schinz var. *uncinatus* Thell. in Scheuermann, 4/5 Jahresber. Niedersächs. B. V. Hannover, 1911/12: 74 (1913) (not seen); in Asch. &

Graebn., Syn. Mitteleur. Fl. 5, 1: 297 (1914); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 503, figure 233 (p. 473) (1959); Brenan in Watsonia 4, 6: 273 (1961). Type: numerous syntypes from Germany (adventive).

Female perianth-segments (in fruit) subequal, lanceolate, (2.5-) 4–5.5 mm long, gradually narrowed above to an elongate subulate point about 1–2.5 mm long, conspicuously hooked towards apex.

LESOTHO—2929 (Underberg): Sehlabathebe Reserve (-CC), Bayliss sub BRI 1316 (K).

CAPE—2723 (Kuruman): Albert District (-BC), Cooper 789 (BM, E, p.p., K).

—3027 (Lady Grey): Barkly East (-DC), Sim 20394 (PRE).

—3126 (Queenstown): Queenstown (-DD), Galpin 2015 (K, PRE) (see note below).

—3226 (Fort Beaufort): Swartkei ("Zwartkey") Shiloh, etc. (-BA), Baur 971 (K).

This species, indigenous to South Africa alone, has been neglected and poorly understood. Its neglect in South Africa has no doubt been due to the facts that it was first described in a flora of mid-Europe, and that it is still poorly represented in herbaria.

Thellung (*l.c.*, *supra*) cited three specimens with the original description: Ecklon & Zeyher 88 from South Africa, and three German specimens found as adventives (Rodleben near Rosslau, 1908, Zobel *s.n.*; Mannheim, 1909, Zimmermann *s.n.*; Döhrener Wollwäscherei near Hannover, 1911, Scheuermann *s.n.*). The first three were placed by Thellung under subvar. *microphyllus* (*l.c.* p. 294) and the Döhren plant under subvar. *elongatus* (*l.c.* p. 295). Neither of the subvarieties seems at present worth recognition, as habit and leaf-size are evidently too much affected by habitat conditions to be of taxonomic significance, and the size of the perianth-segments changes considerably between flower and fruit. These are the leading characters employed in distinguishing the subvarieties.

I have not seen type material of subvar. *elongatus* but I have had on loan from the Botanisches Museum der Universität Zürich the type of *microphyllus* (Germany, Hautwollfabrik Rodleben bei Rosslau (Anhalt), 1 Aug. 1908, Zobel *s.n.* (Z)), and it is typical *A. capensis*. I have no reason, however, in spite of having seen only one of the syntypes (I have not located the others), to doubt the interpretation of the species.

The taxonomy of *A. capensis* is not yet free from problems. Thellung [in Ascherson & Graebner, *Synopsis der Mitteleuropäischen Flora* 5, 1: 294 (1914)] suggested the possibility that it might be a slightly teratological form of *A. dinteri*. However, in 1976 I was fortunate enough to find *A. capensis* in some

abundance along a newly made roadside between Venterstad and Bethulie in Cape Province, South Africa (Brenan 14089), growing with *A. dinteri*, but very obviously quite distinct from that in habit, foliage and floral character, and without any sign of intermediates.

The subspecies *uncinatus*, hitherto considered as a variety of *A. dinteri*, has occurred on numerous occasions in Europe as an adventive, usually if not always introduced with wool [see Brenan in *Watsonia* 4: 273 (1961)]. The subspecies seems much more closely related to *A. capensis* than to *A. dinteri*. Although the extremes of typical *A. capensis* and subsp. *uncinatus* are clearly different, yet there are perplexing intermediates, and much variation in the upper part of the perianth-segments even on one and the same plant. The status of subsp. *uncinatus* requires further study, at present hampered by the lack of material from native habitats.

Galpin 2015 (Queenstown) is anomalous in resembling subsp. *uncinatus* but with very short female perianth-segments even in fruit (2–2.5 mm long). Further material is needed.

Thellung (*l.c.*) cited numerous European specimens (from Germany) with the original description of *uncinatus*. Although I have only so far seen a small piece of one of the originals, there is no reason to have any doubt about the interpretation of the taxon. Thellung subsequently named numerous other adventive specimens, including some from Britain, and the European material so far seen is rather uniform and very characteristic; and there is at Kew the above-mentioned fragment, sent by Thellung to Stapf, of one of the cited gatherings (Germany, Lauritz, Spremberg, 1890, *Riese s.n.*) which is exactly the taxon as usually interpreted.

8. *Amaranthus blitoides* S. Wats. in *Proc. Amer. Acad. Arts & Sci.* 12: 273 (1877); Thellung in *Asch. & Graebn., Syn. Mitteleur. Fl.* 5, 1: 290 (1914); Brenan & Sandwith in *Rep. Bot. Soc. & E. C.* 13: 269 (1948); Aellen in *Hegi, Ill. Fl. Mitteleur.*, ed. 2, 3, 2: 489, fig. 214 (p. 470) (1959). Type from North America.

Annual. Stems mostly prostrate, about 0.2–0.8 m long, usually much branched, when young subglabrous or very inconspicuously puberulous with very short papilliform or straightish hairs. *Leaves* with petiole 3–25 mm long, variable in length on a single plant; axils without spines; lamina oblanceolate to obovate, mostly 10–50 mm long, 3–17 mm wide, glabrous or subglabrous, cuneate-attenuate at base, obtuse to rounded and $\pm$ mucronate at apex, without any purplish central blotch. *Inflorescence* of axillary dense to sometimes rather loose axillary clusters extending to near base of stem; clusters not or scarcely confluent above; inflorescence leafy throughout. *Bracteoles* of ♀ flower about as long as or rather shorter than the perianth. ♂ flowers with 4–5 ovate or ovate-elliptic perianth-segments with a short awn-like point about 0.25–0.6 mm long; *anthers*

exserted, about 0,8 mm long. ♀ flowers with (in fruit) 4–5 unequal oblong to ovate-oblong perianth-segments 2–3 mm long with greenish midrib not or scarcely branched above and not thickened above, mostly (at least the longer segments in each flower) acute at apex, with a very short point up to 0,2 mm long. *Stigmas* 0,25–1,0 mm long. *Fruit* ellipsoid, equalling or very slightly exceeding the longer perianth-segments, circumscissile, smooth to $\pm$ rugose above. *Seed* subcircular to ellipsoid, glossy, blackish, 1,8–2 mm in diameter, with surface almost smooth or only very minutely roughened.

A. blitoides, native of North America, has been rather frequently recorded as an introduction in Europe. In South Africa the evidence of its occurrence is a single specimen collected in 1976.

CAPE—3318 (Bellville): Tygerberg Nature Reserve, Area E above dam (-DC), *Loubser 3485* (NBG).

The other species occurring in South Africa most likely to be confused with *A. blitoides* are *A. dinteri* and *A. thunbergii*. *A. blitoides* differs from both in having 4–5, not 3, perianth-segments and larger seeds. In addition *A. blitoides* differs from *A. dinteri* in the predominantly oblanceolate (rather than obovate) leaves; from *A. thunbergii* in the shorter indumentum on the young parts and in the much shorter points to the ♀ perianth-segments.

9. ***Amaranthus praetermissus* Brenan, sp. nov. (Fig. 2).**

A. angustifolius sensu Adamson in JI S. Afr. Bot. 2, 4: 194 (1936), saltem pro parte, non L.

A. schinzianus sensu Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr., 33 Amaranthaceae: 8 (1936) quoad spec. *Kinges 3464* et al. in nota citata, non Thell.

A. thunbergii sensu Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr., 33 Amaranthaceae: 8 (1936), pro parte, quoad *Marais 4499*, non Moq.

Ut videtur *A. schinziano* Thell. proxima sed segmentis perianthii florum fermineorum plerumque majoribus (saepius 1,5–3 mm nec 0,75–1,5 mm longis) apice in acumen conspicuum 0,25–1 mm. longum plerumque attenuatis fructus excedentibus. Auctoribus multis cum *A. graecizans* L. confusa, sed segmentis perianthii feminei 4–5 nec tantum 3 fructus superantibus facile distinguenda.

Annua, inermis. *Caules* primarii erecti, circiter 200 mm–1 m alti, praesertim basim versus crebre ramosi, glabri, laeves vel juventute praesertim perminute papilloso. *Folia* petiolo 1–15 (-30) mm longo; lamina oblanceolata, oblanceolato-oblonga vel paene linearis, plerumque 10–40 mm longa, 1–10 mm lata, glabra, basi in petiolum gradatim attenuata, apice obtusa vel subacuta et ibi mucrone 0,75–1,5 mm long praedita. *Inflorescentiae* fasciculis densis axillaribus fere usque ad caulis basim superne saepe confluentibus compositae, ubique hinc (nodis



FIG. 2

Amaranthus praetermissus. A, habit. B, part of young stem to show indumentum. C, male flower. D, female flower. E, fruit dehiscent. F, seeds. From *Brenan 14143*.

paucis supremis raro exceptis) foliosae. *Bracteolae* lanceolatae, quam perianthium breviores, apice acuminatae. *Flores masculi* segmentis perianthii 4 ovatis circiter 2 mm longis apice mucrone erecto circiter 0,3 mm longo praeditis. *Antherae* circiter 0,75 mm longae, vix exsertae. *Flores feminei* segmentis perianthii 4-5 subaequalibus lanceolatis vel oblongo-lanceolatis vel nonnunquam oblanceolatis, superne costa viridi non vel leviter ramosa et in acumen erectum vel $\pm$ patens 0,25-1 mm longum angustatis (vel nonnunquam plus minusve rotundatis). *Stigmata* 0,5-0,75 mm longa. *Fructus* ovoideus vel obovoideus, quam perianthium brevior, circumscissilis, superne conspicue rugoso-verrucosus. *Semina* nitida, fere nigra, elliptica vel rotundata, 1-1,2 mm longa, 0,75-1 mm lata, fere laevia.

Type: South Africa, Malalahoek 20 km N.E. of Messina, *Brenan 14143* (K, holotype; NBG, PRE, isotypes).

Annual. *Main stem* or stems erect, about 200 mm-1 m high, with numerous branches especially in lower part, glabrous, smooth or minutely papillose especially when young. *Leaves* with petiole variable in length, 10-15 (-30) mm long; axils without spines; lamina oblanceolate, oblanceolate-oblong or almost linear, mostly 10-40 mm long and 1-10 mm wide, glabrous, attenuate at base into the petiole, obtuse to subacute and distinctly mucronate (0,75-1,5 mm) at apex, green. *Inflorescence* of dense axillary clusters extending to near base of stem; clusters often confluent above; inflorescence thus normally leafy throughout (occasionally a very few of the topmost clusters appearing leafless). *Bracteoles* lanceolate, about half to three-quarters as long as perianth. *Male flowers* with 4 ovate perianth-segments about 2 mm long, with an erect mucro about 0,3 mm long at apex; *anthers* scarcely exserted, 0,75 mm long. *Female flowers* with 4-5 subequal perianth-segments 1,5-3 mm long, lanceolate to oblong-lanceolate or sometimes oblanceolate, at apex tapering (sometimes rounded) into an erect or somewhat spreading acumen 0,25-1 mm long; midrib green, not or somewhat branched above. *Stigmas* 0,5-0,75 mm long. *Fruit* ovoid or obovoid, shorter than perianth, circumscissile, coarsely rugose-warted above. *Seed* glossy, brownish-black, elliptic to almost round, 1-1,2 mm long, 0,75-1 mm wide, almost smooth.

ANGOLA—Mossamedes, 1859, *Welwitsch 6527* (K).

ZIMBABWE—E: Lower Sabi District: Rupisi Hot Springs, 28 Jan. 1948, *Wild 2308 sub Govt. Herb. 19061* (K).

—S: Sabi R., Birchenough Bridge, Jan. 1938, *Obermeyer 37472* (BOL); S: Gwanda District: Tuli Offices, 16 Feb. 1965, *Norris-Rogers 664* (K).

BOTSWANA—N:—1923 (Maun): Maun, above high flood level of Thamelakane R. (-CD), *Biegel & Russell 3723* (K, PRE).

- 2022 (Lake Ngami): N. of Ngwanalekau Hills (-DD), *Buerger 1151* (PRE).
- 2026 (Nata): Moseitse R., 75 m from Francistown (-DA), *Richards 14607a* (K).
- 2127 (Francistown): Francistown (-BA), *McClintock K37* (K); Tonota (-AD), *McClintock K38* (K); N: Tlalamabaie—Masu area, near Soa Pan, *Ngoni 314* (K).
- SW:—2121 (Ghanzi): Ghanzi Camp (-DA), *Brown 7890* (K).
- 2122 (Kobe): Kuke Pan (-AB), *van Son 28740* (BM, PRE).
- 2324: Khutse (-AD), *Shaw 2* sub *Peterhouse 356* (K, PRE).
- 2421 (Tsane): Tsane (Tsani) Police Station (-BB), *de Winter 7451* (K, PRE).
- SE:—2422 (Mashi A Potsana): Mahudatlachi (Mahudutlake) Pan (-AB), *Cox 404* (K).
- SE:—2426 (Mochudi): Mochudi, Phutodikobo Hill (-AC), *Naomi Michison 59, 60* (K).
- S.W.A.—1719 (Runtu): Kapako Camp, 6 km W of Mupini Mission (-DC), *de Winter & Marais 4499* (PRE).
- 1914 (Kamanjab): Kaross (-AD), *Thorne* sub *SAM 35712* (SAM).
- 1918 (Grootfontein): Amkib near Grootfontein (-CA), *Schoenfelder 8452* (PRE).
- 2114 (Uis): 24 km from Uis to Henties Bay (-BB), *Tölken & Hardy 826* (K, PRE).
- 2115 (Karibib): Karibib (-DD), *Kinges 3464* (PRE).
- 2116 (Okahandja): 110 km S of Otjiwarango on Okahandja road (-BB), *Hardy 2140* (K, PRE).
- 2117 (Otjosondú): Quickborn (-AA), *Bradfield 210* (PRE).
- 2214 (Swakopmund): Haigamkab (Haikamchab) (-DB), *Galpin & Pearson 7529* sub *SAM 1592* (K, PRE, SAM); 101 km E of Swakopmund (-?), *Hardy & de Winter 1397* (PRE).
- 2217 (Windhoek): Windhoek (-CA), *Morgan 626/31* (BOL).
- ? 2219 (Sandfontein): Farm Poortje (-?DA), *Merxmüller & Giess 1145* (PRE).
- 2419 (Aranos): Farm Lekkerwater, 51 km E of Aranos (-AB), *van Vuuren & Giess 1104* (K, PRE).
- 2718 (Grünau): 24 km N of Karasburg Drift, just S of Kanus railway siding (-DC), *Wilman 285* (BOL).
- 2818 (Warmbad): Sandfontein (-DA), *Wilman* sub *SAM 28698* (SAM).
- Grid references unknown: Omajume. *Volk 2939* (PRE); 40 km from Omitara, *Liebenberg 4585* (PRE).
- TRANSVAAL—2229 (Waterpoort): Farm Rosenthal near Dongola (-BC), *Codd 4841* (K, PRE); Greefswaldt 89 km W of Messina (-AB), *Pienaar 282* (K,

PRE); Greefswaldt, *Theron 2774* (PRE); Langjan Nature Reserve (-CC), *Huntley 1803* (PRE), *Zwanziger 454* (PRE).

—2328 (Baltimore): Magaebas Nek Farm, Skrikfontein, 85 km NW of Potgietersrus (-?), *Maguire 1500* (NGB).

—2330 (Messina): Messina (-AC), *Moss & Rogers 95* (J), *Rogers 20040* (J); Malalahoek 20 km NE of Messina, *Brenan 14143* (K, holotype; NBG, PRE, isotypes); Tshipise (-CA), *Brenan 14172* (K, MO, PRE).

—2431 (Acornhoek): Satara, Kruger National Park (-BD), *van der Schijff 2268* (PRE).

—2527 (Rustenburg): Brits District, Farm Welgevonden (-?DB), *Mogg s.n.* (PRE).

Grid references unknown: Soutpansberg, Aerodrome koppie, *Verdoorn 2115* (PRE); Fourteen Streams, *Burt Davy 1587* (PRE).

CAPE—2723 (Kuruman): Batlharo (-AD), *Silk 193* (K).

—2824 (Kimberley): Kimberley (-DB), *Wilman 3292* (K), *Wilman s.n.* (K, PRE), *s.n.* (K), *s.n.* (BOL, PRE); 88 km W of Douglas, *Compton 23999* (NBG); Kimberley, Riet Pan, *Moran 15921* (BOL); Voet Pads Drift near Magersfontein (-DC), *Wilman s.n.* (PRE); Spytfontein, *Moss 15343* (BM); Gordonia District, Amob R., 80 km upwards from mouth (-?BA), *Lang 31750* (PRE).

—2922 (Prieska): Spitzkop, N of Nange R. (-?), *Bryant J48* (PRE).

—3025 (Colesberg): Oviston (-DA), *Jooste 547* (PRE).

—3224 (Graaff-Reinet): Graaff-Reinet (-BC), *Bolus 357* (BOL, K).

Grid references unknown: "in vinetis prope Wynberg", *Bolus 7051* (BOL); "Klip Drift, Herbert", *Moran 2* (K), *16641* (BOL).

Without locality: *Drège s.n.* (L).

A. praetermissus, although widespread and in places plentiful, has been consistently misunderstood. Usually it has been misnamed *A. angustifolius* Lam. or *A. graecizans* L. (the two names are synonymous and the latter the correct one). However, *A. graecizans* L., which is widespread in tropical Africa though apparently not reaching our area, is very easily separated by the ♀ flowers possessing only 3 perianth-segments not exceeding the fruit and normally lacking the acuminate apex so characteristic of our plant. In fact, *A. praetermissus* is apparently more closely related to *A. schinzianus* Thell. (though with a very different ♀ perianth) as was acutely noted by the late Dr A. W. Kloos on *Wilman 3292* at Kew (though most other specimens of this taxon were named by him *A. angustifolius* Lam., except for *Moran 2* which he correctly suggested as representing an undescribed species). Suessenguth & Podlech (*l.c.*, *supra*) also included *A. praetermissus* under *A. schinzianus* and cited several specimens in a note, recognising their difference from *A. schinzianus* and suggesting hybridisa-

tion between that an *A. thunbergii*. I am confident, however, that *A. praetermissus* is a distinct species and not a hybrid of such parentage.

A. praetermissus thus appears to be confined to the southern part of Africa from Angola, Botswana and Zimbabwe southwards. It should be looked for in Zambia.

10. *Amaranthus schinzianus* Thell. in Vierteljahrschr. Nat. Ges. Zürich **57**: 535 (1913); Adamson in Jl S. Afr. Bot. **2**, 4: 195 (1936); Suessenguth & Podlech in Merxmüller, Prodr. Fl. Südwestafr., 33 Amaranthaceae: 8 (1966). Type: South-West Africa, "Gross Namaland", *Fleck 171 a* (Z, syntype; L, isosyntype).

A. blitum sensu Cooke & Wright in Thiselton-Dyer, Fl. Cap. **5**, 1: 411 (1910) pro parte, quoad Zeyher 1438, Bolus 11624, non L.

Annual. Stems prostrate to erect, 30–500 mm, $\pm$ branched especially below, but sometimes throughout, glabrous. Leaves with petiole 10–15 mm long; axils without spines; lamina linear-oblongate to almost linear, 5–25 mm long, 0.5–5 mm wide, glabrous, gradually attenuate at base, obtuse and mucronate at apex. Inflorescence of small dense axillary clusters extending to or to near base of stems, clusters often confluent above; inflorescence leafy throughout. Bracteoles minute, ovate to lanceolate, shorter than perianth. σ flowers with 4 elliptic to oblong perianth-segments obtuse to subacute at apex; anthers about 0.5–0.7 mm long. ϕ flowers with (in fruit) (4–)5 subequal, spatulate or obovate perianth-segments 0.75–1.5(–1.75) mm long, whitish except for green midrib which is unbranched or nearly so above, rounded or obtuse (and sometimes very shortly mucronate) at apex. Stigmas 0.25–0.4 mm long. Fruit obovoid-turbinate, exceeding perianth, ? indehiscent or circumscissile, coarsely warted in upper part, brownish when ripe. Seed ellipsoid-rounded or round, glossy, blackish, 1 mm in diameter, almost smooth.

A. schinzianus is confined to South and South-West Africa.

S.W.A.—2316 (Nauchas): between Dubaigabis and Gründoorn (Groendorn) (-DD), Pearson 3173 sub SAM 28372 (SAM); Klein Karas, Groendorn, Örtendahl 367 (K, PRE).

—2317 (Rehoboth): Rehoboth Farm Duineveld REH 437 (-DC), Giess, Volk & Bleissner 6779 (PRE).

—2516 (Helmeringhausen): road from Farm Landsberg to Helmeringhausen (-DD), Kinges 2157 (PRE); dry bed of Helene R., Farm Helmeringhausen, Kinges 2190 (PRE).

—2616 (Aus): Luederitz, ravine S. of Aus, Farm Klein Aus (-CA), Kinges 2324 (PRE).

—2618 (Keetmanshoop): Paradies (-AC), Range 1311 sub SAM 70764 (SAM); Keetmanshoop (-CA), Lubenberg 5199 (PRE).

—2718 (Grünau): Groot Karasberge, Witmond (-BC), Örtendahl 461 (BOL).

K, PRE); Klein Karas (-CA), *Dinter* 4949 (PRE), *Örtendahl* 178 (K, PRE); 8 km on Great Karasberg road from Karasburg-Grünau road (-DC), *Oliver & Steenkamp* 6264 (K).

—2818 (Warmbad): S. of Warmbad (-BD), *Pearson* 4025 (BOL); near Orange R. at Goodhouse (-CC), *Wilman* 259 (BOL).

—2819 (Ariamsvlei): Nakop railway station (-BB), *Marais* 1112 (K, PRE); 3 km W. of Nakop (Nakob), *Theron* 1951 (K, NBG, PRE); 36 km W. of Ariamsvlei along Karasburg-Upington road (-?BB), *Davidse & Loxton* 6420 (PRE).

Grid reference unknown: "Gross-Namaland" Apr. 1889, *Fleck* 171a (Z, syn-type; L, isosyn-type).

CAPE—2921 (Kenhardt): De Hoek, W.S.W. of Kenhardt (-AC), *Leistner* 2356 (K, PRE).

—3118 (Vanhynsdorp): Bitterfontein (Bosjesmanslop) (-AB), *Zeyher* 1438 (BOL, K, NBG, PRE, SAM).

—3120 (Williston): Rietkolk (-AB), *Acocks* 9615 (PRE).

—3221 (Merweville): Prince Albert Road (-DC), *Pillans* 16467 (BOL).

—3321 (Ladysmith): Koup (-AB), *Rehmann* 2983 (Z, holotype), *Esterhuysen* 4510 (BOL).

—3322 (Oudtshoorn): Boter Kraal near Prince Albert (-AA), *Bolus* 11624 (BOL, K).

—3223 (Rietbron): Nelspoort (-AA), *Lewis* 4243 sub SAM 67517 (SAM).

This is a very distinct species on account of its leafy inflorescence entirely axillary combined with 4–5 spatulate to obovate ♀ perianth-segments shorter than fruit. The very narrow foliage is also characteristic. The fruits are conspicuously strongly warted and although apparently sometimes circumscissile, seem to dehisce very tardily, often remaining closed until brown and apparently ripe. I suspect that they may sometimes fall off the plant without dehiscing.

Through the courtesy of the Director of the Botanische Garten und Institut für systematische Botanik der Universität Zürich, I have received on loan the type of *Amaranthus schinzianus* (*Rehmann* 2983), which agrees well with the species as it has been generally interpreted. *Fleck* 171a, also received on loan, is annotated by Thellung "*Amarantus schinzianus* Thellung sp. nov. f. *monstrosa*", but seems to be only a stage of *A. schinzianus* with the fruits enlarged and ripe.

It may be of interest to put on record here that *A. schinzianus* Thell. has occurred as an adventive in Britain [S.W. Yorkshire, v.-c. 63: Corporation Tip, Heckmondwike, 8 Oct. 1964, *J. E. Lousley & C. E. Shaw* W2408 (K!)]. No doubt it was introduced with wool waste. Its occurrence was unknown to me when I revised *Amaranthus* in Britain [*Watsonia* 4: 261–280 (1961)].

11. *Amaranthus deflexus* L., Mant. Pl. Altera 295 (1771); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 313 (1914); Burt Davy. Fl. Transv. 181

(1926); Adamson in *Jl S. Afr. Bot.* 2, 4: 194 (1936); Adamson in Adamson & Salter, *Fl. Cape Penins.*: 361 (1950); Aellen in Hegi, *Ill. Fl. Mitteleur.*, ed. 2, 3, 2: 504, fig. 235 (p. 473) (1959); Brenan in *Watsonia* 4, 6: 274 (1961); Henderson & Anderson, *Common Weeds S. Afr.* 106, fig. 52 (1966); Suessenguth & Podlech in *Merxmueller, Prodr. Pl. Südwestafr.*, 33 *Amaranthaceae*: 8 (1966); Ross, *Fl. Natal* 158 (1972). Type: cultivated at Uppsala, Herb. Linnaeus 1117/18 (LINN, holotype).

A. viridis sensu Cooke & Wright in Thiselton-Dyer, *Fl. Cap.* 5, 1: 411 (1910), non L.

Perennial. *Stems* annual, prostrate or ascending, $\pm$ numerous from root-stock, usually with short, sometimes longer, lateral branches about 0.1–0.9 m long, glabrous or glabrescent below, $\pm$ pubescent with crisped hairs when young. *Leaves* with petiole usually 5–30 mm long; axils without spines; lamina ovate to lanceolate or almost elliptic, often rhombic, 5–60 mm long, 4–30 mm wide, glabrous or nearly so above, shortly and inconspicuously pubescent especially on margins and midrib and lateral nerves beneath, $\pm$ cuneate or cuneate-subtruncate towards base, the base itself $\pm$ attenuate, subacute to obtuse and sometimes slightly emarginate at apex, green and without darker blotches. *Inflorescence* terminal, spiciform or compactly pyramidal-paniculate, 20–120 mm long and about 5–20 mm wide; shorter spikes or clusters often also present in upper and middle axils. *Bracteoles* about half as long as perianth-segments or less. σ^7 *flowers* fewer than and mixed with f , mostly towards ends of spikes or branches, with 2–3 elliptic-acuminate unequal perianth-segments 0.75–1.5 mm long. f *flowers* with 2–3 linear to oblong-oblancheolate, acute or very shortly acuminate perianth-segments about 1.5–2 mm long, hyaline with a green midrib excurrent in a very short mucro about 0.1 mm long. *Stigmas* 0.25–0.4 mm long. *Fruit* clearly exceeding the perianth, indehiscent, smooth or nearly so, 1.75–3 mm long, rounded or obtuse at apex. *Seeds* very glossy, ellipsoid-compressed, blackish-brown, 1–1.2 mm long, 0.75–0.8 mm wide, smooth or almost so, scarcely reticulate.

Widely spread in the tropics and subtropics and common in southern Europe. Native home uncertain but probably temperate South America.

S.W.A.—2217 (Windhoek): Windhoek (-CA), *Seydel* 4070 (K).

— ? 2717 (Windhoek): station ? Leutwein (?-CC), *Dinter* 4258 (BM, SAM).

TRANSVAAL—2528 (Pretoria): Pretoria, near station (-CA), *Sandwith* 185 (K, PRE); Pretoria, Corellilaan, Les Marais, *Hanekom* 1352 (K, PRE).

— 2628 (Johannesburg): near Wattles (-AC), *Moss* 8572 (BM); weed, University of the Witwatersrand (-AA), *Moss* 22683 (J).

O.F.S.—2829 (Harrismith): Rensburgskop, Swinburne (-AD), *Jacobz* 551 (K).

—2926 (Bloemfontein): Bloemfontein, Park Road (-AA), *Potts Blf. U. 7924* (K, PRE).

NATAL—2830 (Dundee): Dundee (-AA), *Truscott 23* (PRE).

—2930 (Pietermaritzburg): Pietermaritzburg, Alexandra Park (-CB), *Huntley 243* (PRE).

LESOTHO—2927 (Maseru): Maseru (-AD), *Williamson 316* (K); Roma (-BC), *Schmitz 284* (PRE).

CAPE—2824 (Kimberley): Kimberley, street (-DB), *Wilman* sub SAM 25348 (SAM).

—3125 (Steynsburg): Middelburg (-AC), *Acocks 15676* (K, PRE).

—3318 (Cape Town): Cape Town (-CD), *Moss 4350* (BM, J); Sea Point (-CD), *Treleven 214* sub SAM 1149 (SAM), sub *Dummer 1274* (E); Kirstenbosch (-CD), *Compton 19423* (BOL, NBG); Cape Town, Rosebank, near station, *Sandwith 186* (K); Rondebosch, *Adamson 2842* (BOL); Stellenbosch (-DD), *Duthie 386* (BOL); Onderpapegaaiberg, *Taylor 5650* (K, PRE).

—3319 (Worcester): Karoo Garden, Worcester, weed (-CB), *Brenan 14047* (K).

—3326 (Grahamstown): Grahamstown (-BC), *MacOwan 3419* (K, SAM).

—3418 (Simonstown): Cape Flats (-BA), *Rehmann 2009* (BM); Somerset West (-BB), *Parker 3793* (BOL, K, NBG).

A. deflexus is one of the most easily recognised species. It is unusual in having a distinctly perennial rootstock from which annual stems arise in a more or less clustered or radiating way. Among the species with terminal inflorescences the large smooth almost inflated fruits, rounded or obtuse at apex and much exceeding the narrow perianth-segments, are most distinctive. The 2–3 perianth-segments and short bracteoles are also shared only with *A. viridis* among the species with terminal inflorescences, but the fruits are totally different. The ellipsoid outline of the seeds is also unusual.

12. *Amaranthus lividus* L., Sp. Pl. 990 (1753); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 313 (1914); Adamson in Jl S. Afr. Bot. 2, 4: 194 (1936); Adamson in Adamson & Salter, Fl. Cape Penins. 361 (1950); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 505, fig. 236 (p. 473) (1959). Type: 18th century cultivated material (BM, neotype); see Townsend, Fl. W. Pakistan, 71 Amaranthaceae: 17 (1974).

Variable in habit, annual or sometimes a short-lived perennial. *Stems* prostrate to erect, 40–750 mm long or tall, numerous and radiating from base or simple and erect, $\pm$ branched, glabrous. *Leaves* with petiole 20–100 mm long, often with considerable range of variation on one plant; axils without spines; lamina ovate to ovate-elliptic, 4–120 mm long, 4–100 mm wide, glabrous, broadly cuneate or rounded-cuneate towards base, shortly attenuate at base it-

self, at apex normally conspicuously emarginate, but sometimes almost rounded. *Inflorescence* lateral and terminal, the terminal part usually leafless, spiciform or paniculate, sometimes leafy to near apex. ♂ *flowers* towards end of spikes or inflorescence branches, with 3 elliptic concavo-convex perianth-segments about 0.5–1.5 mm long, obtuse or subacute at apex. ♀ *flowers* with 3 (sometimes 4–5 in the cultivated forms of subsp. *lividus*, not found yet but perhaps to be expected in the area) perianth-segments, linear-oblong to oblong-subspathulate, 0.75–2 mm long, acute to obtuse at apex, but not or only minutely mucronate or acuminate, with green central part near apex. *Stigmas* 0.25–0.5 mm long. *Fruit* longer than perianth, 1.5–2.5 mm long, indehiscent, compressed, rotund to shortly pyriform. *Seed* glossy, 1–1.5 mm in diameter, blackish-brown, very faintly and minutely roughened, faintly reticulate.

subsp. ***polygonoides*** (Moq.) Probst, Wolladventivfl. Mitteleur. 74 (1949); Brennan in Watsonia 4, 6: 275 (1961). Types from Java and Brazil.

Euxolus viridus (L.) Moq. var. *polygonoides* Moq. in DC., Prodr. 13 (2): 274 (1849).

Female perianth-segments usually obtuse, about 1 mm long. Fruit about 1.5 mm long. Seed 0.8–1 mm in diameter.

CAPE—3318 (Cape Town): Newlands (-CD), *Brenan 14100* (BOL, K, NBG).

—3418 (Simonstown): Princess Vlei (-AB), *Walgate 683* (BOL, PRE); Zeekoevlei (Zeikoei Vlei) (-BA-BB), *Walgate* (BOL).

NATAL—2930 (Pietermaritzburg): Pietermaritzburg (-CB), *Garrett 15* (E); Durban District, Merebank Central (-DD), *Baijnath 2930* (PRE).

A. lividus is widespread in the tropics and warmer regions of the world, and subsp. *polygonoides* in the tropics of both hemispheres. Further synonymy of subsp. *polygonoides* will be found in Brennan (1961), *supra*.

A. lividus is generally easily recognisable. The normally conspicuously emarginate leaves are characteristic. The plant is quite glabrous and the inflorescences usually in part terminal and leafless. The compressed fruits are indehiscent and distinctly longer than the perianth. This combination of characters makes *A. lividus* generally unmistakable, although it is very variable in other ways. In South Africa it is only a rare weed.

Recently Fillias, Gaulliez & Guédès, in Taxon 29, 1: 149–50 (1980), have advocated the resurrection of the name *Amaranthus blitum* L. to replace *A. lividus* L. Because of persistent past confusion with *A. graecizans* L. (starting with Linnaeus himself!), such a revival serves no good purpose. The rejection of *A. blitum* L. as a *nomen confusum* has been therefore formally proposed by Brennan & Townsend in Taxon 29, 5–6: 695–6 (1980).

13. *Amaranthus viridis* L., Sp. Pl. ed. 2, 1405 (1763); Burt Davy, Fl. Transv. 181 (1926); Brenan in Watsonia 4, 6: 275 (1961); Henderson & Anderson, Common Weeds S. Afr. 106 (1966). Type: Herb. Linnaeus 1117/15 (LINN, lecto-type).

A. gracilis Desf., Tabl. Ecole Bot. 43 (1804); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 335 (1914); Adamson in Jl S. Afr. Bot. 2, 4: 195 (1936); Aellen in Hegi, Ill. Fl. Mitteleur., ed. 2, 3, 2: 503, fig. 234 (p. 473) (1959); Ross, Fl. Natal 158 (1972).

Short-lived perennial. *Main stems* erect or decumbent, up to 1 m long, simple or several from near base, themselves with $\pm$ numerous branches, with some short crisped inconspicuous pubescence near young apices, soon glabrous or subglabrous. *Leaves* with petiole variable in length, the longer ones 20–60 (–100) mm long; axils without spines; lamina mostly ovate, sometimes ovate-elliptic, often somewhat rhombic, mostly 20–70 (–80) mm long, 15–50 (–68) mm wide, glabrous or with some very short inconspicuous pubescence on midrib and lateral nerves especially beneath, broadly cuneate or cuneate-rounded towards base, with base itself abruptly attenuate, obtuse or sometimes rounded at apex and usually slightly emarginate and shortly mucronate, green and without darker blotches. *Inflorescence* a green, $\pm$ branched terminal panicle with leafless spiciform branches 20–120 mm long, often interrupted below, often also with branches from upper axils. *Bracteoles* shorter than the flowers. σ^7 flowers few, intermixed with f in inflorescence, but especially towards end of branches, with 3 broadly elliptic concave perianth-segments. f flowers with 3 narrowly oblong to oblong-spathulate perianth-segments about 1–1.5 mm long, whitish with green midrib which is often thickened above, mucronate or not at apex. *Stigmas* 0.25–0.4 mm long. *Fruit* subequalling or slightly exceeding the perianth, indehiscent or irregularly splitting, not circumscissile, very strongly rugose all over. *Seed* only slightly shining, blackish, 1–1.25 mm in diameter; surface minutely and very closely reticulate with the areoles of the reticulum marked by slightly raised verrucae.

Found throughout the tropics and subtropics of the world. Its native home is doubtful; Thellung (1914) discusses the problem, suggesting tropical Asia as the most likely area.

TRANSVAAL—2528 (Pretoria): Pretoria, Corellilaan, Les Marais (–CA), *Hanekom* 1347 (K, PRE).

NATAL—2930 (Pietermaritzburg): Isipingo Beach (–DD), *Ward* 5253 (K), *Ward* 6298 (K).

—2931 (Stanger): Durban, Burman Bush (–CC), *Bourquin* 216 (E); Durban Bayhead (–DD), *Ward* 5115 (K, PRE); Durban, Natal Herbarium grounds, *Schweickerdt* 1364 sub NH 30580 (K, PRE).

CAPE—2824 (Kimberley): Kimberley (–DB), *Wilman* 5708 (K, NBG, PRE).

Among the species with terminal panicles or spikes, *A. viridis* is very easily distinguished by the indehiscent fruits closely and regularly wrinkled and not or only slightly exceeding the perianth. From all except *A. lividus* and *A. deflexus* the flowers with only 3 perianth-segments are quite distinctive. The sculpturing of the seed-surface is also anomalous, although requiring the use of a compound microscope for it to be seen clearly. However, the seeds have a much less glossy testa than its relatives, and this alone can clinch the identity. The seeds, however, must be removed from the green pericarp before examination.

The life-form of *A. viridis* has been misunderstood. Thellung (*l.c.*, *supra*) says that it is annual, querying whether it may be perennial. Aellen (*l.c.*, *supra*) describes it as annual without comment. Examination of various herbarium specimens at Kew led me to doubt very much whether it was always annual. During a visit to Las Palmas, Canary Islands, in spring 1978, I saw numerous plants of *A. viridis* and paid special attention to their life-form. *All* gave evidence of being short-lived perennials with annual stems radiating from the top of a vertical taproot going to about 200–300 mm deep in the soil. It seems, however, possible that flowering may take place in the first year after germination.

14. *Amaranthus muricatus* (Moq.) Hieron. in Bol. Acad. Cienc. Córdoba 4: 421 (1881); Thellung in Asch. & Graebn., Syn. Mitteleur. Fl. 5, 1: 339 (1914); Burt Davy, Fl. Transv. 181 (1926); Adamson in Adamson & Salter, Fl. Cape Penins.: 360 (1950); Aellen in Hegi, Ill. Fl. Mitteleur. ed. 2, 3, 2: 491, figure 216 (p. 470) (1959); Henderson & Anderson, Common Weeds S. Afr. 106 (1966). Type from Argentina.

Euxolus muricatus Moq. in DC., Prodr. 13, 2: 276 (1849).

Perennial. Stems apparently annual, prostrate or ascending, $\pm$ numerous from a stout rootstock, usually with numerous branches, 0.15–0.4 m long, glabrous or sometimes slightly and inconspicuously pubescent near inflorescence. *Leaves* with petiole 5–10 (–15) mm long; axils without spines; lamina linear to linear-lanceolate, rarely lanceolate, 15–80 mm long, 2–10 mm wide, glabrous or almost so, attenuate towards base, usually obtuse and often slightly emarginate or in very narrow leaves acute at apex, green and without darker blotches. *Inflorescence* terminal, narrow, spiciform, leafless, interrupted or continuous, often branched especially below, 30–120 mm long, 5–8 mm wide. *Bracteoles* about half to two-thirds as long as perianth-segments. σ^7 flowers fewer than and mixed with f , with 5 elliptic-subacute perianth-segments about 1–1.5 mm long. f flowers with normally 5 (occasionally 4) narrow, oblanceolate, obtuse to subacute perianth-segments about 1.5–2 mm long, hyaline with a green not or very shortly excurrent midrib. *Stigmas* 0.15–0.25 mm long. *Fruit* subequalling to very shortly exceeding the perianth, indehiscent, closely and clearly rugose-muricate all over, 1.75–2 mm long, with a short beak-like projecting apex. *Seeds* with only moderate glossiness, blackish-brown, 1–1.25 mm long, 0.8–1 mm wide;

surface minutely and very closely reticulate with the areoles of the reticulum marked by slightly raised verrucae.

Native of temperate South America (Argentina, Paraguay, Uruguay). Introduced and locally established in southern Europe, North America and South Africa. A rare adventive in northern Europe.

TRANSVAAL—2528 (Pretoria): Pretoria, Eastern Street (-CA), *Burt Davy s.n.* (PRE).

—2628 (Johannesburg): 15,2 km S.E. of Johannesburg (-AC), *Mogg 34191* (PRE).

O.F.S.—2926 (Bloemfontein): Bloemfontein, Eagle's Nest (-AA), *Potts 2579* (K, L), *Mostert 647* (PRE).

CAPE—2824 (Kimberley): Kimberley (-DA), *Acocks 8572* (PRE).

—3318 (Cape Town): Green Point Common (-CD), *Salter 8382* (BOL).

—3324 (Graaff-Reinet): By Camdeboo R., about 30 km S. of Graaff-Reinet by Aberdeen road (-AC), *Brenan 14073* (K).

A. muricatus is immediately recognised among the South African species of *Amaranthus* with terminal inflorescences by its very narrow leaves and perennial habit. The closely muricate fruits and (under the compound microscope) closely reticulate-verrucose seeds, however, indicate a possible relationship with *A. viridis*, which has much broader leaves and only 3 perianth-segments to the flower.

Although the basionym of *A. muricatus* is often attributed to "Gillies ex Moq.", this is incorrect. Moquin (*l.c.*) published the species as *Euxolus muricatus*, citing "*Amaranthus muricatus* Gillies ! in herb. Hook." as a synonym. There is no indication that Gillies was in any way responsible for *Euxolus muricatus*.

I am much indebted to Dr. T. Myndel Pedersen, of the University of Copenhagen, for help over the nomenclature of this species and for indicating Hieronymus as the originator of the combination *Amaranthus muricatus*.

15. *Amaranthus standleyanus* Parodi ex Covas in *Darwiniana* 5: 339 (1941); *Brenan* in *Watsonia* 4, 6: 278 (1961). Type from Argentina.

A. vulgatissimus sensu Thellung in *Asch. & Graebn., Syn. Mitteleur. Fl.* 5, 1: 343 (1914); *Aellen* in *Hegi, Ill. Fl. Mitteleur.*, ed. 2, 3, 2: 493, figure 219 (p. 471) (1959); et auct. al. eur., non *Spegazz.*

Annual. Stems erect to decumbent, 0,2–0,7 m high, $\pm$ branched, shortly and inconspicuously crisped-pubescent when young, often glabrescent later. Leaves with petiole very variable in length, often short (10 mm or less) but usually some on main stems long (20–70 mm); axils without spines; lamina ovate to elliptic, often subrhombic, about 10–50 mm long, 5–30 mm wide, glabrous or nearly so above, shortly and inconspicuously pubescent especially on margins and midrib

and lateral nerves beneath, broadly cuneate to cuneate-attenuate towards base, obtuse to rounded at apex, sometimes subacute, often emarginate and minutely mucronate, green and without darker blotches. *Inflorescence* of dense sessile clusters, all axillary or the upper condensed into a leafless spiciform panicle up to 50 mm long. *Bracteoles* much shorter than the perianth-segments. ♂ *flowers* fewer than ♀, mostly towards ends of spikes or clusters, with 5 elliptic, acute, scarcely acuminate perianth-segments about 1.5 mm long. ♀ *flowers* with 5 strongly obovate-spathulate perianth-segments about 2–3 mm long, the upper part broad, about 0.75–1 mm wide, spreading, whitish with a green midrib and rounded with a short often patent mucro at apex, below abruptly tapering into a narrow claw about 0.2 mm wide. *Stigmas* about 0.4–0.5 mm long. *Fruit* about as long as or slightly shorter than perianth, indehiscent, the lower part containing the seed strongly and closely rugose all over; the upper part narrower and smooth. *Seed* glossy, deep chestnut-brown, about 0.8–1.1 mm in diameter, almost smooth, not or scarcely reticulate.

A native of Argentina, rarely introduced elsewhere, e.g. South Africa and Europe.

S.W.A.—2216 (Otjimbingwe): Otjozondou (Otjosondou) (-AA), *Seydel* 3373 (L).

CAPE—2922 (Prieska): Prieska (-DA), *Bryant* 890 (K), 47a (K).

A. standleyanus is very easily distinguished by the combination of 5 very strongly spathulate perianth-segments on the ♀ flowers, indehiscent fruits strongly and closely wrinkled in the lower part and smooth in the upper.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the help received from numerous people during the course of this study. Particular thanks are due to my colleague Mr. C. C. Townsend of the Royal Botanic Gardens, Kew, who has himself made important contributions to our knowledge of *Amaranthus* but who has generously made his experience and advice freely available throughout.

I am also most grateful to Professor Brian Rycroft, Director of the National Botanic Gardens, Kirstenbosch, South Africa, and to Dr. John Rourke, Curator of the Compton Herbarium, for permission to work in that Herbarium and to examine *Amaranthus* there. An equal debt of gratitude is due to Dr. Bernard de Winter, Director of the Botanical Research Institute, Pretoria, for similar facilities there. Grateful thanks are also due to Professor E.A.C.L.E. Schelpe for facilities kindly given at the Bolus Herbarium, Cape Town. All these herbaria have also been kind enough to make subsequent loans.

To the authorities of the following other herbaria, whose material I have examined, I am also grateful:

Edinburgh, Royal Botanic Garden;

Johannesburg, the Moss Herbarium, University of the Witwatersrand;

Leiden, Rijksherbarium;

London, British Museum (Natural History).